

FORT CAMPBELL, KENTUCKY

TECHNICAL DESIGN

GUIDE

Instructions for Use

This Document has been prepared jointly by the Fort Campbell Public Works Business Center and the Louisville District Army Corps of Engineers. Contents of the document are controlled by the Business Center. It is updated and housed at the Louisville District in accordance with Engineering Division ISO Certified policies and procedures.

The document contains mandatory criteria, policies, and procedures that apply to all design and construction at Fort Campbell.

To aid the reader, the document utilizes (blue) hyperlink text, which can be accessed by “clicking” the colored text. In addition, much of the document is formatted using construction-industry “CSI” standards and Unified Facilities Guide Specifications (UFGS).

Highlighted text is part of the most recent document update 30 September 2005.

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CHAPTER 1

General Information and Administrative Requirements

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CHAPTER 1

General Information and Administrative Requirements

1-1 Purpose

1-1.2 Prior to the development of this Technical Design Guide, the source for Ft. Campbell specific Engineering and design guidance was contained in the “*Fort Campbell Installation Design Guide (IDG)*” and the “*Louisville District Architect-Engineer Design Guide (AEDG) for Military Construction.*” The “**Fort Campbell, Kentucky, Technical Design Guide**” has been developed to provide a single-source comprehensive resource for technical requirements regarding all MILCON and OMA program projects located on post. The technical guidance and criteria in this document is considered specific to Fort Campbell and it applies to all engineering and construction efforts completed by the Public Works Business Center (PWBC), The US Army Corps of Engineers (COE), and all Contract A-E designers.

1-1.2 .The “**Fort Campbell, Kentucky, Technical Design Guide**” is the result of ongoing joint efforts between Fort Campbell and Louisville District. The document is the property of the Fort Campbell, Public Works Business Center. It is maintained and made available through the Louisville District COE. A joint PWBC and COE committee oversees maintenance, evaluation, and revision of the technical contents. Specific guidance and criteria contained within are developed through specialized sub-committees with representatives from engineering, construction, and maintenance personnel from Ft. Campbell and Louisville COE. It is intended by the committee that the document continuously grow to accept additional information, accept changes in technology, and reflect changes in Army guidance, policies and visions.

1-1.3 The Fort Campbell PWBC vision includes the need for consistent design and construction of environmentally sound, energy efficient, easily maintainable facilities. . This technical document is part of an ongoing commitment to bring that vision into reality at Ft. Campbell.

1-2 Document Format

1-2.1 The technical content of this document uses Construction Specifications Institute (CSI) format.

1-2.2 Fort Campbell Requirements are considered mandatory. Requirements shall be reflected on construction contract documents and support data.

1-2.3 Instructions to Designers provide technical directions and describe where Fort Campbell Requirements shall be stated in contract and supporting documents.

1-3 Application

1-3.1 Contents of this document shall apply to design and construction effort for all MCA funded and OMA funded projects completed by the PWBC and/or the Louisville District COE. It applies to both in-house staff and to contracted designers.

1-3.2 This document shall be used in collaboration design and Urgan Design requirements described in companion document: ACSIM, [Installation Design Standards](#), also available on the Internet.

1-4 Design Submittals

1-4.1 All MILCON funded project designs shall follow design and submittal procedures outlined in the Project Management Plan (PMP) together with the A-E Scope of Services, or the in-house Quality Control Plan/Contract.

1-4.2 All OMA funded project designs shall follow design and submittal procedures identified in the designer prepared “[Scope Definition Document](#)” and Scope of Services or Contract.

1-4.3 It is the responsibility of the Designers of Record to insure technical contents of this document are incorporated into design documents prior to submission for review.

1-5 Document Improvements and Deviations

1-5.1 The committee considers this to be a “Living Document.” Recommended changes, additions and requests for deviation are invited from anyone who uses it. Recommended changes, additions, additional guidance topics and requests to deviate from the guidance are accepted at any time. Recommendations can be offered electronically or in paper form or by verbal request. To assist those reviewing recommendations, a sample form containing the needed information is available in [Figure 1](#). Completed forms shall be provided to the PWBC or Louisville COE Committee Members identified below:

PWBC

LARRY MARTIN
(270) 956-1801
martinl@campbell.army.mil

TED REECE
(270) 798-7311
reecet@campbell.army.mil

COE

LARRY M. COZINE
(502) 315-6250
Larry.M.Cozone@lrl02.usace.army.mil

JOHN BRIGGS
(270) 798-7223
John.N.Briggs@lrl02.usace.army.mil

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Chapter 1

Figure 1:

Recommended Document Change

Please Indicate the Type of Proposed Change:

☐ Modification ☐ New Topic

Please Indicate the Recommended Priority:

☐ Routine ☐ Urgent

Please Explain the Proposed Change:

Please identify any guidance, criteria, or reasons causing the proposed change:

Please Provide the Point of Contact who generated this proposal:

Name: _____

Phone: _____

Email: _____

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CHAPTER 2

General Requirements

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CHAPTER 2

General Design Provisions

2.0 General Design Criteria

MILCON Projects

For new construction in the MILCON program, design effort will be completed in accordance with the approved Project Management Plan (PMP), design contract scope of services, and identified criteria. The ACSIM, [Installation Design Standards](#), together with this document shall both apply to engineering and construction actions.

OMA Projects

For Operations and Maintenance projects, design effort will be completed in accordance with the PWBC contract scope of services. Scope of design services shall be based upon the designer prepared project specific [Scope Definition Document](#) that is completed after a pre-design conference and site evaluation.

2.0.1 Deliverables

Hard-copy Drawings

Final construction contract drawings and as-built drawings submitted for official government records shall be digital and placed on 24" x 36" plastic film (Mylar) sheets. Sheet border shall be provided by PWBC-EDB. A graphic scale shall be shown on each sheet of the drawings.

Electronic drawings submitted for review shall be reproduced on 8-1/2" x 11" or 11" x 17" paper using a laser printer.

Digital Drawings

CADD Drawings containing Geographic data (Site Plan, Survey and Mapping Plan, Storm Sewer Plan, Electrical Utilities Plan...) will use the Tennessee (TN) State Plane Coordinate System. The Datum used will be the North American Datum of 1983 (NAD83). The mapping units will be US feet. Vertical upland topographic surveys will use North American Vertical Datum (NAVD) 1988.

Digital geographic data will have accuracy within two feet unless otherwise stated in the Scope of Work.

Digital geographic data will be 99% free of topological errors including, but not limited to: the absence of dangling nodes, undershoots, overshoots, and snapped nodes for line segments (road centerlines, edge-of-curb, elevation contours...); the existence of features that have area square footage (building footprints, parking lots, sidewalks...) will have polygon representations in the CADD drawings.

All CADD drawings shall be done on Intergraph Microstation Release 5 or a compatible approved equal system.

The CADD Drawing file naming convention shall follow Chapter 2 of the "A/E/C CADD Standards" Document within the Spatial Data Standards Facilities/Infrastructure/Environment (SDS/FIE) model maintained by the CADD/GIS Technology Center (<http://tsc.wes.army.mil>).

Layer/Level assignments of feature data within the CADD drawings will follow 'Appendix A: *Model File Level/Layer Assignment Tables*' of the "A/E/C CADD Standards" Document within the Spatial Data Standards Facilities/Infrastructure/Environment (SDS/FIE) model maintained by the CADD/GIS Technology Center (<http://tsc.wes.army.mil>).

The "A/E/C CADD Standards" Document (26MB) are available at the following internet site: <http://tsc.wes.army.mil/products/tssds-tsfmts/tssds/projects/sds/>
To request an "A/E/C CADD Standard" CD, go to http://tsc.wes.army.mil/comments/aecstds_comments/AECSDS-CommentForm.asp and fill out the CD request form.

The 'CADD Drawing file naming convention' is referenced in the 'Release 2_x Document' folder on of the "A/E/C CADD Standards" CD. It is an Adobe Acrobat PDF document named 'volume1.pdf'. See Chapter 2 for 'CADD Drawing Naming Convention' standards.

The 'Layer/Level assignments of feature data within CADD drawings' is referenced in the 'Release 2_x Document' folder on the "A/E/C CADD Standards" CD. It is an Adobe Acrobat PDF document named 'volume1.pdf'. See 'Appendix A: *Model File Level/Layer Assignment Tables*' within the PDF document.

For MILCON projects, Drawings shall also be prepared in accordance with COE Standards available from the PE/A.

For OMA projects, Drawings shall also be prepared in CADD format using standard 24" X 36" sheets.

Drawings for all projects that are ready to Advertise (RTA) shall be in the approved electronic format.

Specifications-

For MILCON projects, Construction specifications shall be UFGS in accordance with the Scope of Services. Specification for projects that are RTA shall be included only in the approved electronic format.

For OMA projects, Construction specifications shall be prepared as agreed in the Scope Definition Document. Specifications for projects that are RTA shall be included only in the approved electronic format.

Design Analysis

For MILCON projects, design support documentation shall be provided. The Design Analysis shall be completed in the approved format. At the conclusion of the design effort, the documentation shall be provided in an approved electronic format.

2.0.2 Antiterrorist / Force Protection

All new construction projects including additions and alterations shall include antiterrorist / Force Protection (AT/FP) features in accordance with UFC 4-010-01, DOD Minimum Antiterrorism Standard for Buildings.

2.0.3 Fire Protection/Life Safety

Every project including MILCON and OMA shall be designed using only the following DOD directed criteria:

- [UFC 1-200-01, General Building Requirements](#) shall be used mandatory guidance concerning required model building codes for design and construction.
- Fire Protection requirements shall comply with [UFC 1-300-01, Fire Protection Engineering For Facilities.](#)
- Exiting requirements shall comply with the Life Safety Code, NFPA 101.

2.0.4 Metric Design

Consideration of Metric dimensioning (SI) is required for all MILCON projects. When metric dimensioning is used within construction contract documents, “hard” metric dimensioning is the mandated COE standard. Project specific guidance is available through the Louisville District project PE/A.

For OMA projects, metric dimensioning is used on a case-by-case basis: If the original project was developed in English (IP) units, follow-on OMA projects can also use English inch-pound (IP) units. If the original documents were developed in metric units, the OMA projects must also be executed in metric.

2.0.5 Surveying and Mapping Requirements

Fort Campbell has the following control point network and datum requirements for every MILCON project.

- Two new control monuments shall be established on site and tied to Tennessee State Plane Coordinate System NAD 83.
- The survey control points are GPS Class I and Class II Horizontal with additional elevation coming from an off-post USGS Class I bench mark to establish Second Order Class II vertical on all survey control points.
- Hardcopy books of existing points (including sketches) are maintained at both Fort Campbell (POC Scott Slade (270) 798-9724) and the Louisville District (POC Chris Heintz (502) 315-6408).
- For work contracted by Louisville District, the contractor is required to establish a permanent baseline at the project. In areas where existing concrete monuments are abundant, iron pins with caps are allowed. The contractor supplies CELRL-ED-M-SM (Survey and Mapping Section) with description sheets for the points they establish and the District forwards the information to Fort Campbell.
- Similarly, OMA work performed by Fort Campbell will have the survey control point data reported to the PWBC POC for forwarding to the District.

2.0.6 Geotechnical Requirements

The following is a list of aggregate sources for concrete, asphalt, stone-base, sub-base, and DGA which met or exceeded the quality standards set forth in the technical sections of the COE specifications for Fort Campbell projects:

Coarse material sources for base course, bituminous paving, cast-in-place structural concrete, concrete pavements, and pre-cast architectural concrete.

- Hopkinsville Stone, Hopkinsville, KY, Ledges 11 to 17, about 85 feet.
- KY Stone Company, Canton, KY, Ledges 2 and 3, about 33 feet.
- Vulcan Materials, Gilbertsville, Kentucky. Ledges 4 and 26, about 393 feet.
- Martin-Marietta Aggregates, Smithland, Kentucky, Ledges 16 to 19, about 51 feet.
- Vulcan Materials, Clarksville, TN, Ledges 16 & 17, about 30 feet.
- Winn Materials, Clarksville, TN, Ledge 3, about 20 feet.

Natural fine aggregate sources for concrete, asphalt, stone-base, subbase and DGA are listed below.

- Delta Materials, Henderson, Kentucky.
- Ingram Materials, Paducah, Kentucky.
- Mayfield Aggregates, Mayfield, Kentucky.
- Delta Materials, Cairo, Illinois Manufactured fine aggregates for concrete:
- Hopkinsville Stone Company, Hopkinsville, Kentucky.

POC for further information at the Louisville District contact:

Mr. David Black (502) 315-6436

Mr. David Kiefer (502) 315-6445

2.0.7 Cost Engineering

Every project both MILCON and OMA requires a construction cost estimate. For MILCON projects the estimate shall be prepared using M-CACES software. Cost estimates for OMA projects shall be provided to the PWBC at the time of submittal for bid issue. Official government cost estimates are not to be made public. They remain the property of the Government, and FOR OFFICIAL USE ONLY.

2.0.8 Engineering Considerations and Instructions for Field Personnel

This documentation is required for all MILCON projects, and is normally a part of the Design Analysis. It offers the designers an opportunity to provide a written document providing important design facts to the construction field personnel. An example format of the [Engineering Instructions](#) is provided, which shall be revised and reflect project specific information.

2.0.9 Transfer and Acceptance

Completion of the Transfer and Acceptance of Military Real Property, DD Form 1345 is required for all projects. A draft copy of this information must be submitted with the Final Design submittal. This requirement applies to both MILCON and OMA program projects.

2.1 Special Ft. Campbell Criteria

2.1.1 Historic District

The “Clarksville Base” portion of Ft. Campbell contonment area is eligible for the National Register of Historic Places as a significant Cold War historic district. Designers are required to consult with the State Historic Preservation Office (SHPO) and the federal Advisory Council on Historic Preservation for any projects that are sited at the Clarksville Base. POC is PWBC Environmental Division Cultural Resource Manager at 270-798-7437.

2.1.2 Environmental

The Environmental Division is under the guidance of the Public Works Business Center at Fort Campbell. The [Environmental Division](#) Internet address will provide added information and points of contact.

Environmental Compliance is mandatory for all projects.

- **Designers shall NOT contact Kentucky or Tennessee regulators** regarding environmental issues. Contact the Ft. Campbell Environmental Div.
- A 40-hour "Environmental Quality Officer" course is available bi-monthly on post by Ft. Campbell's Environmental Division. Designers are encouraged to attend.
- Designs shall take into consideration wetlands and endangered species on the installation.
- Several environmental topics contained in this document include the following:

APPENDIX A:

[Occupational Health Considerations](#)

[Clean Air Act](#)

[Clean Water Act](#)

[Safe Drinking Water Act](#)

[TSCA \(Lead Paint\)](#)

[\(Radon\)](#)

[FIFRA \(Pesticides\)](#)

[Solid Waste Disposal/Diversion Practices](#)

[Hazardous Waste Disposal Practices](#)

[Emergency Planning and Community Right to Know](#)

APPENDIX B:

[State Water and Sewer State Submittals](#)

2.1.3 Underground and Aboveground Storage Tanks

Aboveground and underground petroleum product storage tanks shall not be permitted at new construction projects without design review and approval by the Public Works Business Center, Environmental Division Petroleum Storage Tank Program Manager.

Underground Storage Tanks (USTs) shall not be installed without approval from the PWBC Environmental Division. If permitted, USTs shall be double walled steel fiberglass coated with interstitial monitoring and automatic tank gauging. The monitoring system shall be compatible with the systems already in use and capable of being remotely monitored by the Environmental Division. No used oil USTs shall be installed.

Above Ground Storage Tanks (ASTs) shall not be installed without approval from the PWBC Environmental Division. If permitted, ASTs shall follow requirements

outlined in the Ft. Campbell: [Standard Design Requirements For Aboveground Fuel Tanks](#) prior to submission for permit requests.

Design for used petroleum products holding and storage shall not include tanks. Only 55-gallon drum containers shall be used that are placed on approved pavement materials properly designed for hazardous spill containment.

2.1.4 Solid Waste Disposal / Recycling Diversion Practices

In the interest of reducing waste, Fort Campbell is actively recycling and reducing waste in all on-post operations. Contractors are required to participate in on-post programs. They are encouraged to find ways of reducing waste. Recycling shall be practiced to the maximum extent possible. Refuse materials shall be separated in accordance with installation policies and practices.

It is the intent of the installation to divert at least 40% of all construction demolition debris from the Woodlawn C/D landfill. Buildings and building materials removal / deconstruction activities shall be executed with landfill diversion as a primary goal.

Contract specifications shall require at least a 40% diversion of demolished building materials such as wood, plumbing fixtures, electrical materials (lights and panels), windows, doors, toilet partitions, HVAC equipment, and scrap metals be diverted from the landfill. Diversion can be accomplished by deconstructing the wood buildings and components per instructions below or by moving the structure off-post. Construction specifications shall require a Building Materials Diversion Plan to be submitted and approved by PWBC.

All material disposal and diversion shall be handled in accordance with Appendix A-7, [Solid Waste Disposal/Diversion Practices](#). Salvageable materials shall not to be transported off the installation.

2.1.5 Erosion and Sedimentation Control

Erosion and sedimentation control is required for activities that result from opening, operating, and closing all site excavation and excavation at present and planned borrow pits on the Fort Campbell Military Reservation.

The requirements contained in the Appendix I, [Erosion and sedimentation Control](#) shall apply at Fort Campbell, KY by its military units and all authorized subcontractors. It provides step-by-step procedures to help plan, design, and install soil and water Best Management Practices (BMP). It does not override any local, city, county, state, or federal rule, regulation, or law, including job safety and utility safety laws. Where there is a difference between this plan and any language contained in any contractual document, the contractual document must be followed.

The guidance provides criteria for the design, installation, and maintenance of water management and sediment control practices to abate nonpoint source (NPS) Pollution.

Those responsible for design of these practices should evaluate the conditions existing on a particular site and determine if the minimum criteria contained in these standards are adequate or if more stringent criteria should be used.

Properly applied, this information will provide an efficient plan to operate the borrow pit site(s) while ensuring maximum safety and minimizing adverse impact to the environment. By following these guidelines, it is the intent of this management tool to furnish a uniform plan that will provide continuity throughout the life of the borrow pit.

2.1.5 Permits

Local permits are required for construction activities at Ft. Campbell. These permits must be Contractor completed and submitted prior to beginning any construction effort. Contract documents must identify and contain permits that will apply to the contract. . Local permits shall include demolition, digging, excavation, compaction, electrical, fuel tank installation, and environmental. Several of the specific permit forms that apply are located within sections this document along with information identifying appropriate installation drop-off locations and points of contact.

[Digging and Excavation Permits](#) [Borrow Permits](#)

In addition, Specifications requirements shall include Contractor requirements for obtaining all utility and state (Kentucky or Tennessee) permits. These are related to utility services and various environmental topics.

2.1.6 Mold and Moisture Control:

Design features identified in [Appendix G](#) are critical to long term building environmental quality. They shall be incorporated into all projects.

2.1.7 Fort Campbell PWBC Computer Software Capabilities:

Software capabilities may vary within the PWBC. To assure that electronic files can be accessed, the following versions of software are commonly utilized in the PWBC:

Microstation, version 8, 2004 (8.5)

Microsoft Office
2000

Digital files being transferred to Fort Campbell should be saved to allow accessibility with the above software. Files shall not be “write protected” or “view only”.

2.1.8 Installation Internet Addresses

[Ft. Campbell](#)

[The Public Work Business Center](#)

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GENERIC SCOPE DEFINITION DOCUMENT

The following 2 pages contain a generic example standardized “Scope Definition Document” which is required for each military O&M task order.

Items in black are part of the standard format.

Items in red are project task order specific, and should be changed for each customer request.

Items in blue are options to be considered.

DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, LOUISVILLE
CORPS OF ENGINEERS

SCOPE DEFINITION DOCUMENT

For

PROJECT NAME

At

LOCATION

Date

1. **BACKGROUND:** Public Works Center, Detroit Arsenal defined a need for roof replacement on Buildings 229 & 231 at the Warren, MI facility (Site Map - see Enclosure 1), due to leaks and the age of the existing roofing material. There is also work slated to repair & replace air-handling units on these roofs under a separate contract prior to this replacement. Nick Ballard (ED-D-A) attend the meetings, surveyed the structures and obtained photographs and drawings for COE Louisville. This is a year-end funded design Project and must be finalized by mid-September 2000.

Information for this Scope of Work was acquired during a site visit to Detroit Arsenal on June 27, 2000 with the following personnel in attendance at meetings or the site. Kirk Dailey & Nick Ballard COE – Louisville; Jim Park (PWBC Director), Bob Novak (Chief of Engineering Plans and Services) & Nabil Tominna (Project PE/A) of PWC Detroit Arsenal.

2. **DESCRIPTION OF WORK:** Each building is approximately 42,000 S.F. with 5400 S.F. of Penthouse roof and 36,600 S.F. of main roof with typical rooftop equipment. (Bldg. Photos - see Enclosure 2). All building equipment and problems were surveyed during the site visit and noted for review and plan preparation. (Field Notes - see Enclosure 3). PWC Detroit Arsenal provided 11 existing drawings pertinent to this roof project. (Reference Drawings - see Enclosure 4) They will also provide information as to equipment to be abandoned, capped off, removed and utility line rerouting. The customer has requested informal reviews when construction contract documents are approximately 50% complete, and a final review when 100% complete.

Initial discussions derived at the site visit and discussions indicated that the customer preferred replacement be a Modified Bitumen Roof. Existing built-up roofing is approximately 20 years old, and although in very good condition, will soon need replacement. No major environmental hazardous conditions exist. (Asbestos Reports – see Enclosure 5).

The customer also stated that he would like to receive contractor furnished an Operations and Maintenance Manual, including the manufacturers' cut-sheets showing recommended future roof penetration methods.

- Special Environmental Concerns or Requirements and Responses:
- Lead Based Paint Removal: **None**
- Asbestos Abatement: **(4) Roof samples being taken contained no asbestos.**
- Other: **None**
- Fire Protection or Life Safety Concerns or Requirements: **None**
- Special work sequencing or Optional items: **None**

1. SCOPE OF DELIVERABLES TO BE PROVIDED:

Design: **[Simplified Design Method Plans and Specs]**

Review: **?? sets ½ full size CAD prints & Specs – hard copy**

Contract: **(1) Electronic CD/Hard disc to DOC**

Post Award: All final records, and (1) electronic version Microstation drawings & specs

4. TYPE OF CONSTRUCTION CONTRACT: **Job Order Contractor (JOC)**

5. DESIGN TEAM & PWBC REVIEWERS:

- COE Louisville: **N. Ballard, J. Jagers, G. Minter (QC) / M. Mirzaian (PE/A)**
- PWBC:
 - Engineering:
 - Master Planning:
 - Environmental
 - Maintenance Shops:
 - Safety:
 - Fire Department:
 - ITBC:
 - End User:

6. DESIGN COST ESTIMATE: **\$15,000 (See Attachment 1)**

7. DESIGN SCHEDULE: **10 July to 10-12 September 2000**

8. CONSTRUCTION COST ESTIMATE: **Base Bid: \$480,000
Option 1: \$518,000**

9. QUALITY EXPECTATIONS: Minimum QCP w/ one A/E reviewer. When signed by all parties, this document becomes the contract with the ED customer.

This package has been completed and assembled by the PE/A: **Nicholas M. Ballard**

This assembled complete package has been checked for completeness and compliance with the Engineering Division Quality Operating System.

Any change in any one of the items above will require a modification of this contract.

ED PE/A Name: Nicholas M. Ballard

Customer Name: Kirk P. Dailey

ED Unit Name: ED-D-A

Customer Office Symbol: PM – M

Signature: _____

Signature: _____

Date Signed: 11 August 2000

Date Accepted: 11 August 2000

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EXAMPLE

Engineering Considerations and Instructions for Field Personnel

B-1 General

B-1.1 Contractor's construction trailers on site must be wired per NEC, meet separation clearances, have electric meters but no water meters. COE is to coordinate with PWBC Master Plans and utility personnel.

B-2 Civil

B-2.1 Notification of road closures during construction shall be given to the following agencies:

- Provost Marshall Office, Traffic Section, NCOIC, Staff Sergeant Smith (270) 798-4725.
- Directorate of Public Works Business Center, Master Plans, (270) 798-2909.

B-3 Geotechnical

B-3.1 During stripping and rough grading, positive surface drainage should be maintained to prevent the accumulation of water. The exposed subgrade materials are likely to be soft in some locations. Also, if conditions are encountered which are different from those described in the plans, the geotechnical engineer should be notified. Once subgrades are established, concentrated loads from construction equipment could cause pumping of the subgrade and require re-compaction.

B-3.2 Foundation designs are based on the subsurface investigation program. To verify that the foundation designs are appropriate for the structures, inspection by Corps of Engineers of the footings and undercutting is very important. Linda Davis (502) 315-6437 or Steve Durrett should be notified of the contractor schedule for performing earthwork and foundations so that inspections of the materials can be performed.

B-4 Utilities / Landscaping

B-4.1 Care should be taken in placement of underground utilities so as not to cause interference with landscaping trees.

B-4.2 Railroad crossings for gas and water piping are to be included in the drawings. The portion of the AREA-03 (the reference from which the details are taken) dealing with railroad crossings is included with these instructions.

B-4.3 Where gas and water piping are shown to be valved and capped for future expansion, the valve should be a gate valve. These are installed to prevent the need to shut down a section of the main and interrupt service in order to connect a new service line.

B-4.4 Valves should be placed to isolate each building from the main service (water and gas), and to allow only for minimal main shut down when tying to existing main lines.

B-5 Architectural

B-5.1 Hold metal roofing pre-submittal meeting, with construction, supplier, and contractor to discuss standing seam metal roof system specifications.

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Fort Campbell Standard Design Requirements For Aboveground Fuel Tanks (ASTs)

Effective date: 1 January 1999

This S.O.P. has incorporated the National Electrical Code (NEC), National Fire Protection Association (NFPA Code), Underwriters Laboratories (UL), and Industry standards.

1.0 General:

- 1.1 All aboveground petroleum/fuel tanks, (ASTs) shall conform to all Federal, State, Local regulations and guidelines, and with these design requirements. This includes tanks for permanent placement as part of new construction, as replacement of existing storage systems, and tanks used for temporary storage by construction Contractors and military units.
- 1.2 All ASTs shall be double-walled type tanks. Means shall be provided to establish the integrity of the secondary containment.
- 1.3 When there is a discrepancy between any or all of these guidelines, these requirements will be the final authority over all others except NFPA.
- 1.4 The Public Works Business Center, Environmental Division, Petroleum Storage Tank Manager is the Installation Local Authority Having Jurisdiction (AHJ) who must approve any design proposal and construction before any installation of an AST.

2.0 Definitions:

Fuel tank: is any vessel containing more than 60 U.S. gallons of Class I or Class II flammable liquids.

Emergency Vent: An opening, construction method, or device that will automatically relieve excessive internal pressure due to an exposure fire.

Normal Vent: as a minimum size, all vents shall be at least 1-¼ inches in inside diameter. It must have a bug proof, rain cap secured on top of the vent. The vent must be at least 3 feet higher than the highest point within a 10-foot radius of the ATS.

Anti-siphon valve: a device to prevent any siphoning due to damaged fuel lines, broken pumps, leaky or leaking fuel pumps. This device is not a check valve.

Overfill protection device: a device to serve as a catch basin to prevent any and all overfill spillage. Minimum size shall be 5 gallons.

Fuel Level Gauge: a device that is easily readable that automatically indicates the actual fuel level in the AST. A standard float type gauge is acceptable.

Temporary AST: a fuel tank that will be used for up to 90 calendar days. At which time, it then becomes a permanent installed tank.

Emergency shut-off valve: A device to immediately shut off the fuel supply in case of an emergency or a fire.

Portable Fuel Tank: Any closed vessel having a liquid capacity over 60 U.S. gallons, and less than 2,000 U.S. gallons, and not intended for fixed installation.

Day Tank: A fuel tank, located inside a structure, that provides fuel to a engine. The standard size of a day tank is 25 U.S. gallons, but may have the capacity of up to 100 U.S. gallons.

Secondary Containment Tank: A tank having an inner and an outer wall with an interstitial space between the walls and having means for monitoring the interstitial space for a leak.

Flammable Liquid: Any Liquid within the scope of this S.O.P. and subject to the requirements of this S.O.P. shall be known generally as either a flammable liquid or a combustible liquid and shall be defined and classified in accordance with this S.O.P.

Gasoline: Is a Class I B liquid that has a flash point below 73° F and a very high boiling point between 100° and 400° F. The Flash point of Gasoline is -40° to -50° F.

Diesel Fuel: Is a Class II Combustible Liquid, with a flash point of 125° F.

Combustible Liquid: A combustible liquid shall be defined as any liquid that has a closed-cup flash point at or above 100° F, as determined by the test procedures and apparatus set forth in 1-7-4, of NFPA 30.

3.0 Location of AST:

- 3.1 All proposed installations sites of ASTs must have written prior approval by the Local Authority Having Jurisdiction.
- 3.2 All permanently installed ASTs shall be of the concrete encased, double walled type. The concrete encased tanks shall be of at least 3,500-psi density and be at least 6 inches in thickness.

3.3 Clearance distances:

- 3.3.1 No AST shall be installed closer than 5-feet from any type of an electrical disconnect device.
 - 3.3.2 All ASTs between the size of 60 U.S. gallons and 2,000 U.S. gallons shall be located no closer than 10-feet from any building, lean-to, or property line.
 - 3.3.3 All ASTs shall have at the minimum of 5 ft of unobstructed clearance on all sides to facilitate refueling, maintenance and serviceability.
 - 3.3.4 No AST shall be installed without having at least a 15-foot aerial clearance from overhead or underground electrical lines, which includes but limited to weather heads, transformers, and fuses.
 - 3.3.5 The minimum distance between any two ASTs shall be 3-feet.
 - 3.3.6 The minimum distance between an AST with Gasoline or Diesel fuel and a LP tank shall be 20-feet.
- 3.4 All ASTs shall rest on the ground or on foundations, made of concrete, masonry, piling, or steel. Tank foundations shall be designed to minimize the possibility of uneven settling of the tank and to minimize corrosion in any part of the tank resting on the foundation.

4.0 Aboveground Fuel Lines:

- 4.1 Below ground fuel, lines shall not be permitted for use with an AST.
- 4.2 Aboveground supply and return lines.
 - 4.2.1 Fuel lines shall be suspended a minimum of 6 inches off the ground and be supported every 3-feet with some type of approved support.
 - 4.2.2 All AST fuel lines shall be protected against corrosion.
 - 4.2.3 All ASTs shall have some type of protective features that prohibit any collision from motor vehicles.
 - 4.2.4 All above ground fuel lines shall be insulated, heat traced, and protected with a covering equal to vinyl.
 - 4.2.5 The fuel lines shall be separated by a minimum distances of 6 inches.
 - 4.2.6 All AST aboveground fuel lines shall be of black carbon type steel.
 - 4.2.7 All AST aboveground supply fuel lines shall be ½-inch inside diameter, unless otherwise directed.
 - 4.2.8 All AST aboveground supply fuel lines shall have a shut off valve located as close as possible to the AST.
 - 4.2.9 All AST aboveground return fuel lines shall be ¾-inch inside diameter, unless otherwise directed by the Local Authority having Jurisdiction.
 - 4.2.10 There shall be no traps or check valves in the return fuel line to the AST.
 - 4.2.11 All pipe joints shall be of the threaded type, no welding of pipes or of the joints shall be permitted.

- 4.2.12 Joints shall be made liquid tight and shall be threaded, except that listed flexible connectors shall be permitted where installed with prior written approval of the Local Authority Having Jurisdiction.
- 4.2.13 All threaded joints shall be made up tight with a suitable thread sealant or lubricant. Joints in piping systems handling Class I liquids shall be welded when located in concealed spaces within buildings.

5.0 Normal Venting for aboveground Tanks:

- 5.1 Venting requirements shall be in accordance with current Unified Facilities Guide Specifications, Section 13202, Fuel Storage Systems requirements. Stage I vapor recovery is the process of recovering vapors when a storage tank is filled. Stage I vapor recovery is mandatory on all Army Facilities. Stage II vapor recovery is the process of recovering vapors during vehicle fueling operations. Stage II vapor recovery is optional and will be included if required by state and local clean air regulations.
- 5.2 Prevent the development of vacuum or pressure sufficient to exceed the design pressure due to filling or emptying and the atmospheric temperature changes.
- 5.3 If any tank has more than one fill or withdrawal connection and simultaneous filling or withdrawal can be made, the vent size shall be based on the maximum anticipated simultaneous flow.
- 5.4 The outlet of all vents and vent drains on tanks equipped with venting to permit pressures exceeding 2.5 psig shall be arranged to discharge in such a way as to prevent localized overheating of, or flame impingement on, and part of the tank, in the event vapors from such vents are ignited.
- 5.5 Where vent pipe outlets for tanks storing Class I liquids are adjacent to building or public ways, they shall be located so that the vapors are released at a safe point outside of buildings and not less than 12 ft. above the adjacent ground level. In order to aid their dispersion vapors shall be discharged upward or horizontally away from closely adjacent walls. Vent outlets shall be located so eaves will not trap the flammable vapors or other obstructions and shall be at least 5 ft from building openings.

6.0 Emergency Venting for Fire Exposure for Aboveground Tanks.

- 6.1 Every aboveground tank shall have some form of construction or device that will relieve excessive internal pressure caused by exposure fires. This requirement shall also apply to each compartment of a compartmented tank, the interstitial space of a secondary containment type tank, and the enclosed space of tanks of closed top dike construction.

- 6.2 The outlet of all vents and vent drains on tanks, equipped with emergency venting to permit pressures exceeding 2.5 psig shall be arranged to discharge in such a way as to prevent localized overheating of or flame impingement on any part of the tank, in the event vapors from such vents are ignited.

7.0 Miscellaneous Requirements:

- 7.1 All ASTs permanently installed shall have a device(s) for fuel leak detection, fuel level, and all other monitoring requirements.
- 7.2 All ASTs shall be marked in accordance with N.F.P.A. 704.
- 7.3 All ASTs shall be grounded, and wired in accordance with NEC 70.
- 7.4 All ASTs shall have some type of spill containment that will hold 100% of the AST capacity.
- 7.5 All ASTs that have filling and emptying connections for any Class I or Class II, flammable liquids shall be closed and liquid tight when not in use and shall be properly identified.
- 7.6 All ASTs fill caps shall have an AHJ approved means of locking when not being refueled.
- 7.7 All ASTs shall have some device of fire fighting equipment in the immediate area. (Contact Fort Campbell Fire Prevention Section for further details).
- 7.8 Means shall be provided for determining the level of liquid in the tank. This means shall be accessible to the delivery operator.
- 7.9 Precautions shall be taken to prevent the ignition of flammable vapors. Sources of ignition include, but are not limited to:
- a. Open Flames
 - b. Lightning
 - c. Hot surfaces
 - d. Radiant heat
 - e. Smoking
 - f. Cutting and welding
 - g. Spontaneous ignition
 - h. Frictional heat or sparks
 - i. Static electricity
 - j. Electrical sparks
 - k. Stray currents
 - l. Ovens, furnaces, and heating equipment.

End

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TECHNICAL DESIGN GUIDE

CHAPTER 3

Technical Requirements and Instructions

SECTION 00800
Special Contract Requirements

Ft. Campbell Requirements

Ft. Campbell Specification Section 00800, Special Contract Requirements, shall apply to all MILCON projects.

Contents shall also be applied to all OMA projects issued by the Ft. Campbell Directorate of Contracting (DOC) or the COE.

Instructions to Designers

1. Modify the project specifications paragraphs as necessary to include all applicable portions of the Ft. Campbell 00800 version:
[Section 00800, Special Contract Requirements.](#)
2. For electronic copies of the document, contact the PE/A for MILCON and OMA projects by the COE. A-E's directly serving the installation should contact the PM.

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Ft. Campbell Version (Partial) Specification

Section 00800: Special Contract Requirements

20. WARRANTY OF CONSTRUCTION (MAR 1984) ALTERNATE 1 (APR 1984) FAR 52.246-21I.

20.1 General Requirements.

20.1.1 In addition to any other warranties in this contract, the Contractor warrants, except as provided in paragraph 20.1.10 of this clause, that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, or design furnished, or workmanship performed by the Contractor or any subcontractor or supplier at any tier.

20.1.1.1 Warranty Payment.

Warranty work is a subsidiary portion of the contract work, and has a value to the Government approximating 1% of the contract award amount. The Contractor will assign a value of that amount in the breakdown for progress payments mentioned in the Contract Clause: Payments Under Fixed-Price Construction Contracts. If the Contractor fails to respond to warranty items as provided in paragraph 20.5, the Government may elect to acquire warranty repairs through other sources and, if so, shall backcharge the Contractor for the cost of such repairs. Such backcharges shall be accomplished under the Changes Clauses of the contract through a credit modification(s).

20.1.1.2 Since the warranty period will extend beyond the construction completion date, this contract shall remain open until the warranty period expires.

20.1.2 This warranty shall continue for a period of 1 year from the date of final acceptance of the work. If the Government takes possession of any part of the work before final acceptance, this warranty shall continue for a period of 1 year from the date the Government takes possession.

(a) As a part of the one year warranty inspection, the Contracting Officer will conduct an infrared roof survey on any project involving a membrane roofing system. This survey will be conducted in accordance with ASTM C1153-90, "Standard Practice for the Location of Wet Insulation in Roofing Systems Using Infrared Imaging". In accordance with paragraph 20.1.3 and 20.1.4, the Contractor shall be required to replace all damaged materials and to locate and repair sources of moisture penetration, at no additional cost to the Government.

20.1.3 The Contractor shall remedy at the Contractor's expense any failure to conform, or any defect. In addition, the Contractor

shall remedy at the Contractor's expense any damage to Government-owned or controlled real or personal property, when that damage is the result of--

(a) The Contractor's failure to conform to contract requirements; or

(b) Any defect of equipment, material, workmanship, or design furnishes.

20.1.4 The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for 1 year from the date of repair or replacement.

20.1.5 The Contracting Officer shall notify the Contractor, in writing, (see para. 20.2.3 and 20.5) within a reasonable time after the discovery of any failure, defect, or damage.

20.1.6 If the Contractor fails to remedy any failure, defect, or damage within a reasonable time after receipt of notice, (see para. 20.5) the Government shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor's expense.

20.1.7 With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall--

(a) Obtain all warranties that would be given in normal commercial practice;

(b) Require all warranties to be executed, in writing, for the benefit of the Government, if directed by the Contracting Officer; and

(c) Provide names, addresses, and telephone numbers of all subcontractors, equipment suppliers, or manufacturers with specific designation of their area of responsibilities if they are to be contacted directly on warranty corrections; and

(d) Enforce all warranties for the benefit of the Government, if directed by the Contracting Officer.

20.1.8 In the event the Contractor's warranty under paragraph 20.1.2 of this clause has expired, the Government may bring suit at its expense to enforce a subcontractor's, manufacturer's, or supplier's warranty.

20.1.9 Unless a defect is caused by the negligence of the Contractor or subcontractor or supplier at any tier, the Contractor shall not be liable for the repair of any defects of material or design furnished by the Government nor for the repair of any damage

that results from any defect in Government-furnished material or design.

20.1.10 This warranty shall not limit the Government's rights under the Inspection and Acceptance clause of this contract with respect to latent defects, gross mistakes, or fraud.

20.1.11 Defects in design or manufacture of equipment specified by the Government on a "brand name and model" basis, shall not be included in this warranty. In this event, the Contractor shall require any subcontractors, manufacturers, or suppliers thereof to execute their warranties, in writing, directly to the Government.

20.2 Performance Bond.

20.2.1 The Contractor's Performance Bond will remain effective throughout the construction warranty period and warranty extensions.

20.2.2

(a) In the event the Contractor or his designated representative(s) fails to commence and diligently pursue any work required under this clause, and in a manner pursuant to the requirements thereof, the Contracting Officer shall have the work performed by others, and after completion of the work, will charge the remaining warranty funds established by paragraph 20.1.1.1 of any or all expenses incurred by the Government while performing the work, including, but not limited to administrative expenses.

(b) In the event sufficient funds are not available to cover the warranty work performed by the Government at the Contractor's expense, the Contracting officer shall have the right to recoup expenses from the bonding company.

20.2.3 Following oral or written notification of required warranty repair work, the Contractor will respond as dictated by para. 20.5. Written verification will follow oral instructions. Failure of the Contractor to respond will be cause for the Contracting Officer to proceed against the Contractor as outlined in the paragraph 20.2.2 above.

20.3 Pre-Warranty Conference.

Prior to contract completion and at a time designated by the Contracting Officer, the Contractor shall meet with the Contracting Officer to develop a mutual understanding with respect to the requirements of this clause. Communication procedures for Contractor notification of warranty defects, priorities with respect to the type of defect, reasonable time required for Contractor response, and other details deemed necessary by the Contracting Officer for the execution of the construction warranty shall be established/reviewed at this meeting. In connection with these requirements and at the time of the

Contractor's quality control completion inspection, the Contractor will furnish the name, telephone number and address of a licensed and bonded company which is authorized to initiate and pursue warranty work action on behalf of the Contractor. This point of contact will be located within the local service area of the warrantied construction, will be continuously available, and will be responsive to Government inquiry on warranty work action and status. This requirement does not relieve the Contractor of any of his responsibilities in connection with other portions of this provision.

20.4 Equipment Warranty Identification Tags.

20.4.1 The Contractor shall provide warranty identification tags on all Contractor and Government furnished equipment which he has installed.

(a) The tags shall be similar in format and size to the exhibits provided by this specification, they shall be suitable for interior and exterior locations, resistant to solvents, abrasion, and to fading caused by sunlight, precipitation, etc. These tags shall have a permanent pressure-sensitive adhesive back, and they shall be installed in a position that is easily (or most easily) noticeable. Contractor furnished equipment that has differing warranties on its components will have each component tagged.

(b) Sample tags shall be submitted for Government review and approval. These tags shall be filled out representative of how the Contractor will complete all other tags.

(c) Tags for Warrantied Equipment: The tag for this equipment shall be similar to the following. Exact format and size will be as approved.

EQUIPMENT WARRANTY
CONTRACTOR FURNISHED EQUIPMENT

MFG	MODEL NO.
SERIAL NO.	
CONTRACT NO.	
CONTRACTOR NAME	
CONTRACTOR WARRANTY EXPIRES	
MFG WARRANTY(IES) EXPIRE	

MFG

MODEL NO.

SERIAL NO.

CONTRACT NO.

DATE EQUIP PLACED IN SERVICE

MFG WARRANTY (IES) EXPIRE

20.5.1 Following oral or written notification by the Contracting Officer or an authorized representative of the installation designated in writing by the Contracting Officer, the Contractor shall respond to warranty service requirements in accordance with the "Warranty Service Priority List" and the three categories of priorities listed below. If the Contractor does not perform the warranty within the timeframe

specified, the Government will perform the work and backcharge the warranty payment item established under paragraph 20.1.1.1.

First Priority Code 1 Perform on site inspection to evaluate situation, and determine course of action within 4 hours, initiate work within 6 hours and work continuously to completion or relief.

Second Priority Code 2 Perform on site inspection to evaluate situation and determine course of action within 8 hours, initiate work within 24 hours and work continuously to completion or relief.

Third Priority Code 3 All other work to be initiated within 3 work days and work continuously to completion or relief.

The "Warranty Service Priority List" is as follows:

- Code 1 Air Conditioning Systems
 - a. Recreational support.
 - b. Air conditioning leak in part of building, if causing damage.
 - c. Not cooling unit
- Code 3 Doors
 - a. Overhead doors not operational.
 - b. Interior/Exterior personnel doors or hardware not functioning properly.
- Code 1 Electrical
 - a. Power failure (entire area or any building operational after 1600 hours).
 - b. Security lights.
 - c. Smoke Detectors.
- Code 2 Electrical
 - a. Power failure (no power to a room or part of building).
 - b. Receptacle and lights (in a room or part of building).
- Code 3 Electrical
 - a. Street Lights.
- Code 1 Gas
 - a. Leaks and breaks.
 - b. No gas to family housing unit or cantonment area.
- Code 1 Heat
 - a. Area power failure affecting heat.
 - b. Heater in unit not working.

- Code 1 Hot Water heater Failure
- Code 2 Kitchen Equipment
 a. Dishwasher.
 b. All other equipment hampering preparation of a meal.
- Code 3 Plumbing
 a. Leaky faucets.
- Code 2 Plumbing
 a. Flush valves.
 b. Fixture drain, supply line commode, or any water
pipe
 leaking.
 c. Commode leaking at base.
- Code 3 Interior
 a. Floors
 b. Paint chipping or peeling
 c. Casework
- Code 1 Roof Leaks
 Temporary repairs will be made where major damage to
 property is occurring.
- Code 2 Roof Leaks
 Where major damage to property is not occurring, check
 for location of leak during rain and complete repairs
 on a Code 2 basis.
- Code 2 Water (Exterior)
 No water to facility.
- Code 2 Water, Hot
 No hot water in portion of building listed
- Code 3 All other work not listed above.

20.5.2 Should parts be required to complete the work and the parts are not immediately available the Contractor shall have a maximum of 12 hours after arrival at the job site to provide the Contracting Officer or an authorized representative of the installation designated in writing by the Contracting Officer, with firm written proposals for emergency alternatives and temporary repairs for Government participation with the Contractor to provide emergency relief until the required parts are available on site for the Contractor to perform permanent warranty repair. The Contractors proposals shall include a firm date and time that the required parts shall be available on site to complete the permanent warranty repair. The Contracting Officer or an authorized representative of the installation designated in writing by the Contracting Officer, will evaluate the proposed alternatives

and negotiate the alternative considered to be in the best interest of the Government to reduce the impact of the emergency condition. Alternatives considered by the Contracting Officer or an authorized representative of the installation designated in writing by the Contracting Officer will include the alternative for the Contractor to "Do Nothing" while waiting until the required parts are available to perform permanent warranty repair. Negotiating a proposal which will require Government participation and the expenditure of Government funds shall constitute a separate procurement action by the using service.

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01356	<u>Stormwater Pollution Protection</u>
01560	<u>Environmental Protection</u>
01572 - 01670	<u>Construction and Demolition Waste Removal/Diversion Recycle of Recoverable Materials</u>

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CHAPTER 3

Division 01000

Technical Requirements and Instructions

SECTION 01356
Stormwater Pollution Protection

Ft. Campbell Requirements:

Ft. Campbell special requirements apply Section 01356 , for all COE and PWBC prepared projects.

Instructions to Designers:

1. Project plans and specifications shall include guidance and requirements contained in [Erosion and Sedimentation Control](#):
2. Additional required guidance is found in [Chapter 2](#).
3. For electronic copies of the document, contact the PE/A for MILCON and OMA projects by the COE. A-E's directly serving the installation should contact the PM.

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CHAPTER 3

Division 01000

Technical Requirements and Instructions

SECTION 01360
Environmental Protection

Ft. Campbell Requirements:

Ft. Campbell specification Section 1560 , Environment Protection shall be used instead of UFGS 01355 for all COE and PWBC prepared projects.

Instructions to Designers:

4. Project specifications shall include the Ft. Campbell Specification:
[Section 01560, Environment Protection](#).
5. Additional required guidance is found in [Appendix A](#).
6. For electronic copies of the document, contact the PE/A for MILCON and OMA projects by the COE. A-E's directly serving the installation should contact the PM.

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Ft. Campbell version:
Section 01560, Environment Protection.

SECTION C-01560

ENVIRONMENT PROTECTION
4/03

PART 1 GENERAL

1.1 SUMMARY (Not Applicable)

1.2 SUBMITTALS

The following shall be submitted in accordance with Section C-01300 SUBMITTAL PROCEDURES:

1.2.1 SD-8, Statements

Work Plans; GA.

1.2.1.1 Environment Protection

Prior to commencement of work at the site, the Contractor will submit within 10 calendar days after Notice to Proceed, his written detailed proposal for implementing the requirements for environmental pollution control specified herein. The contractor will then meet the representatives of the Contracting Officer upon their completion of review of his proposal as needed for compliance with the environmental pollution control program.

1.2.1.2 Preconstruction Survey

Prior to start of any onsite construction activities, the Contractor and the Contracting Officer shall make a joint condition survey, after which the Contractor shall prepare a brief report indicating on a layout plan the condition of trees, shrubs, and grassed areas immediately adjacent to the site of the work and adjacent to his assigned storage area and access routes(s) as applicable. This report will be signed by both the Contracting Officer and Contractor upon mutual agreement as to its accuracy and completeness.

1.2.1.3 Waste Disposal Scheme

As part of his proposed implementation under Paragraph 3.2, and prior to onsite construction, the Contractor shall submit a description of his scheme for disposing of waste materials resulting from the work under this contract. If any waste material is dumped in unauthorized areas, the Contractor shall remove the material and restore the area to the condition of the adjacent undisturbed areas. Where directed, contaminated ground shall be excavated, disposed of as approved, and replaced with suitable fill material, all at the expense of the Contractor.

PART 2 POLLUTION PREVENTION PLANS

2.1 ENVIRONMENTAL PROTECTION REQUIREMENTS

Provide and maintain, during the life of the contract, environmental protection as defined. Plan for and provide environmental protective measures to control pollution that develops during normal construction practice. Plan for and provide environmental protective measures required to correct conditions that develop during the construction of permanent or temporary environmental features associated with the project. Comply with all Federal, State, and local regulations.

2.1.1 Environmental Protection Plan

The contractor will develop a site specific Environmental Protection Plan which will address in detail the following:

a. Hazardous materials (HM) to be brought onto the post

Any hazardous materials planned or used on the post by the contractor will be managed with the same intent and purpose as the Hazardous Materials Management Program (HMMP) maintained by the PWBC Environmental Division Pollution Prevention Branch. Ft. Campbell's HMMP was established to maintain effective and regulatory compliant management of hazardous materials used on the post. The HMMP provides establishment of source reduction methods, recycling and reuse opportunities, modifications of processes and procedures, shelf life management, authorized HM use list, full visibility of all HM at any given time, the least toxic and least amount of HM acquired, stored, or used, and proper handling, storage, and disposal of all HM. A hazardous material as per 29 CFR 1910.1200 will be included. A hazardous material as per 29 CFR 1910.1200 is any material which is a physical or health hazard. The

Contractor shall complete the FTCKY HAZMAT INVENTORY FORM , which appears as an appendix to this section. The inventory form requires a list (including quantities) of HM to be brought to the post and copies of the corresponding material safety sheets (MSDS). The completed form shall be submitted to the Contracting Office representative and to Fort Campbell Environmental Division - Pollution Prevention Branch. In the event the usage of additional Hazardous Materials are found necessary during the project, they will be included into the MSDS package of the Environmental Protection Plan. At project completion, any hazardous material brought onto the post shall be removed from the site by the Contractor. Ft. Campbell is required by Executive Order 12856, "Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements", to comply with the requirements of the Emergency Planning and Community Right-to-Know Act (EPCRA). EPCRA requires Ft. Campbell to identify the amounts of chemicals present on, or released from its facilities, understand the potential problems that hazardous materials pose to the surrounding communities and environment, and provide information to the public and local emergency planning organizations. To comply with EPCRA requirements, Ft. Campbell must track and be accountable for hazardous materials (HM) used throughout the post. As required by the Emergency Planning and Community Right - to - Know Act (EPCRA), the Contractor will account for the quantity of HM brought to the post, the quantity used or expended during the job, and the leftover quantity which (1) may have additional useful life as HM and shall be removed by the Contractor, or (2) may be hazardous waste, which shall then be removed as specified herein. This information will be provided to the Environmental Division Pollution Prevention Branch on a calendar year basis or project basis if less than a single calendar year, and must be submitted by the end of January following the year reported.

b. Hazardous waste (HW) generated

The Environmental Protection Plan must list, quantify explain how any HW generated during the project will be disposed. Disposal of hazardous waste generated by the contractor shall be disposed off site according to applicable regulations at the contractor's expense. A report must be submitted annually of the generation of hazardous waste on post and must be provided to the

Contracting Officer representative and to Environmental Division - Pollution Prevention Branch.

c. Storage of hazardous waste

In accordance with post regulations and 40 CFR 262, hazardous waste shall be stored near the point of generation up to a total quantity of (one quart) 1 L of acutely hazardous waste or (55 gallons) 200 L of hazardous waste (Satellite Accumulation Point). Any volume exceeding these quantities shall be moved to a HW permitted area within 3 days. Locations of hazardous waste storage areas must be approved by PWBC-ED-PP. Containers must be labeled in accordance with 40 CFR 262 and must contain the words Hazardous Waste and other words which identify the contents of the container. Prior to shipment of hazardous waste on site or off, the waste must be placed into good condition Department of Transportation (DOT) specification containers for hazardous waste (49 CFR 172.101). Containers must be labeled with required labels for HW and for DOT shipping. The area selected for the storage of hazardous wastes must minimize the threat to human health or the environment in the event of a release.

d. Minimization of hazardous waste

In accordance with post regulations, the Contractor should substitute materials as necessary to reduce the generation of HW and include a statement to that effect in the Environmental Plan.

e. Environmental conditions likely to be encountered during this project

Contact the Contracting officer for conditions in the area of the project which may be subject to special environmental procedures. Include this information in the Preconstruction Survey. Describe in the Environmental Plan any permits required prior to working the area, and contingency plans in case an unexpected environmental condition is discovered.

f. Any Hazardous Waste removal or disposal must be manifested through Environmental Division's Pollution Prevention Branch, Hazardous Waste Program Manager and must be signed and numbered. Permitting plans for any transportation and disposal, excavation, or construction of

hazardous waste that will require an environmental permit from an issuing agency

The Contractor is responsible for generating the permits and delivering the completed documents to the Contracting Officer. The Contracting Officer will review the permits and the Contractor shall file the documents with the appropriate agency and complete disposal with the approval of the Contracting Officer. The Contracting Officer shall advise Environmental Plan of any Hazardous Waste generated and shall send contractor to Environmental Pollution Protection Branch. Correspondence with the State concerning the environmental permits and completed permits shall be delivered to the Contracting Officer.

g. Radon mitigation design and testing

All residential and non-residential construction performed at Fort Campbell must have radon mitigation features implemented into the design. The contractor will install preliminary features as per drawings. The contractor will hire an independent testing company to perform radon monitoring prior to inhabitation of the units. The firm must be EPA accredited and approved to perform work in the State of Tennessee (Kentucky). A list of accredited testing firms in the state of TN (KY) can be obtained through the state Radon Program Coordinator (615) 532-0733. In the event radon concentrations greater than 4 pCi/l (pico curies per liter) are revealed consult Fort Campbell DPW through the Contracting Officer's representative for guidance pertaining to retesting. If upon further testing unacceptable levels are present, additional mitigation features will be installed followed by more testing. The buildings will not be inhabited until levels of less than 4 pCi/l have been achieved.

2.1.1.1 Environmental Protection Plan Format

The Environmental Protection Plan shall follow the following format:

1. Hazardous materials to be brought onto the post
2. MSDS package
3. Employee training documentation
4. Hazardous materials/waste storage plan
5. Hazardous waste to be generated
6. Pre-construction survey results

7. Permitting requirements identified
8. Waste Disposal Plan
9. Site Specific Spill Contingency Plan

2.1.1.2 Environmental Plan Review

Fourteen days after the environmental protection meeting, submit to the Contracting Officer the proposed environmental plan for further discussion, review, and approval.

2.1.1.3 Commencement of the Work

As directed by the Contracting Officer, following approval.

2.1.2 Storm Water Pollution Prevention Plan

The following Pollution Prevention Plan is incorporated into the contract documents as a portion of the construction activities to be undertaken by the Contractor. The plan as outlined below contains the minimum requirements for the work under this contract.

POLLUTION PREVENTION PLAN FOR (PROJECT)

The purpose of this plan is to detail the controls that will be utilized for this construction in order to control sediment in the storm water runoff from the construction site drainage area.

Project Location: Fort Campbell Army Base
Fort Campbell, Kentucky
(PROJECT)
(LOCATION)
Latitude - 36 38'10" North
Longitude - 87 27' 40" East
(Values Approximate for Latitude - Longitude)

Constructed by: U.S. Army Corps of Engineers
Louisville District
P.O. Box 59
Louisville, KY 40201-0059

Description of Site and Construction Activity: This construction is (INSERT DESCRIPTION).

The soil disturbing activity will consist of clearing and grubbing and demolition for the installation of the erosion and

sediment control features, grade work, excavation for utilities, and parking lots. The sediment and erosion controls being utilized include straw bale dam, basket curb inlet, stone outlet sediment trap, fabric drop inlet protection, gravel donut inlet protection, construction entrance/exit, silt fence, and silt fence rock overflow, and temporary seeding and mulching. Clearing and grubbing must be held to a minimum necessary for grading and equipment operation.

Temporary seeding and mulching shall be deemed necessary if no construction activity occurs in the disturbed areas for more than fourteen (14) days. Construction must be sequenced to minimize the exposure time of cleared surface areas. Grading activities must be avoided during periods of highly erosive rainfall. Slopes of 2H:1V will be protected using an erosion control blanket. Other slopes that may be seeded and mulched may experience washout problems and require the use of an erosion control blanket. Contractor is to refer to manufacturer's recommendations for the type of erosion control blanket to be used on particular slopes.

Runoff Coefficient: The present runoff coefficient for the site is approximately 0.6 to 0.75. The development of the site will not significantly increase this coefficient. Developed coefficient is approximately **(INSERT COEFFICIENT)**.

Receiving Waters: The water for the disturbed areas will pass through erosion control then into the storm system. The storm system for the majority of the site empties into **(LOCATION)**.

Erosion and Sediment Controls:

STABILIZATION PRACTICES	STRUCTURAL PRACTICES	
Permanent Seeding	Straw Bale Dam	Gravel Donut Inlet
Mulching	Basket Curb Inlet	Protection
	Stone Outlet Sediment	Temporary Construction
	Trap	Entrance/Exit
	Fabric Drop Inlet	Silt Fence
	Protection	Silt Fence Rock Overflow

2.1.2.2 Contracting Officer shall provide Environmental Plan for review to Environmental Division, Pollution Protection Branch.

2.2 ANTICIPATED SEQUENCE OF ACTIVITY:

Place erosion control measures in locations in close proximity to those shown on the drawings. Additional erosion control measures may be required to comply with the NPDES permit once demolition and construction begins.

Surface water flowing toward the construction area will be diverted around the construction area to reduce its erosion potential. Silt fence, sediment traps or straw bale check dams shall be properly constructed to detain runoff and trap sediment.

Construct new site amenities including utilities, buildings, parking areas, and sidewalks after completing the necessary demolition.

Landscape and grade remaining areas according to the drawings.

Upon completion, remove any temporary measures not necessary for future phases of the project after stabilization of the area. Any sediment removed from these measures shall be disposed of at a time and location designated by the Contracting Officer. Any other areas disturbed during the removal of the sediment control structures shall be seeded and mulched within 24 hours.

NOTE: The Contractor controls the actual sequence, however, the sediment control measures must be established prior to initiation of work in any area. Contractors for Phased projects will be required to coordinate this work and interface Pollution Prevention Plans to ensure compliance with the intent of the Pollution Control Plans and to maintain continuous pollution prevention. Construction should be staged or phased for this project. Areas of one phase should be stabilized before other phases are initiated. Stabilization shall be accomplished by temporarily or permanently protecting the disturbed soil surface from rain fall impacts and runoff.

2.3 DEMONSTRATION OF COMPLIANCE WITH FEDERAL, STATE AND LOCAL REGULATIONS.

All activities constructed under this contract will be performed in accordance with Federal, State and Local regulations. The construction contractors specifications require compliance with all applicable regulations.

2.4 POLLUTION PREVENTION PLAN AND NOTICE OF INTENT

The Contractor will implement the Pollution Prevention Plan (PPP) as shown on the plans and directed in these specifications. This plan must be implemented in accordance with the NPDES permit. A Notice of Intent (NOI) will be prepared by the U.S. Army Corps of Engineers and submitted to the state of Tennessee (KENTUCKY) fourteen (14) days prior to the notice to proceed being issued. The NOI Contractor Consent form for Tennessee (KENTUCKY) must be signed by the Contractor. A blank [Contractor's Signature Form](#) is attached at the end of this section. The Contractor shall maintain a copy of the PPP in their construction trailer. Any changes made to the plan must be documented and approved by the Contracting Officer.

2.5 INVENTORY FOR POLLUTION PREVENTION PLAN

The materials or substances listed below are expected to be present onsite during construction:

These are examples of materials that could be Hazardous Materials and an inventory must be kept using Ft. Campbell's Hazardous Material Form attached. This list is not comprehensive but for illustration only. The Contractor must maintain and update a Hazardous Material list and inventory forms.

Concrete	Fertilizer	Detergents	Paints (Enamel and Latex)
Cleaning Solvents	Wood	Sealants	Metal Rebar/Structural Steel
Concrete Additives	Tar	Asphalt	Petroleum Based Products

2.6 SPILL PREVENTION

The following are the material management practices to reduce the risk of spills or other accidental exposure of materials and substances to storm water runoff.

2.6.1 Good Housekeeping

- a. An effort will be made to store only enough product required to perform the task. Storage shall meet Federal, State and Local regulations to include 150 % containment of bulk storage over 19 liters.

b. All materials stored onsite will be stored in a neat and orderly manner in their appropriate containers and properly labeled. When possible, material should be stored under a roof or in an enclosed area. If this is not possible, material will be covered with a tarpaulin or suitable replacement to prevent direct contact between storm water and the materials. All runoff from the storage area will be routed through a control structure.

c. Products will be kept in their original containers with the original manufacturer's label.

d. Substances will not be mixed with one another unless recommended by the manufacturer.

e. Whenever possible, all of the product will be used up before disposing of container.

f. Manufacturer's recommendations for proper use and disposal will be dictated by Federal, State and Local regulations. Manufacturer's recommendations may be followed if as stringent or more than Federal, State and Local.

g. The contractor will conduct daily inspections to ensure proper use and disposal of materials onsite.

2.6.2 Hazardous Products

These practices are used to reduce the risks associated with hazardous materials and must be incorporated into the Pollution Prevention Plan:

a. Products will be kept in their original containers unless they are not resealable.

b. Original labels and material safety data will be retained they contain important product information.

c. All containers will have the Diamond label affixed per the National Fire Prevention Associations Publication 704.

d. Disposal of surplus product will be performed as recommended by the manufacturer or as required by State and Local regulations.

2.7 SPILL PREVENTION PRACTICES

In addition to good housekeeping and material management practices discussed in the previous sections of this plan, a Site Specific Spill Contingency Plan must be prepared by the Contractor and submitted to Fort Campbell Environmental Division. The SSSCP must be developed as outlined in the Fort Campbell Environmental Handbook. Guidance and instructions for preparation of the SITE SPECIFIC SPILL CONTINGENCY PLAN (SSSCP) are included at the end of this section. In addition to the requirements of the SSSCP, the following practices must be followed by the Contractor for spill prevention and clean up:

- a. Materials and equipment necessary for cleanup will be kept in the material storage area. There will be enough equipment to supply at least three (3) men. Equipment and materials will include but not be limited to; brooms, dust pans, mops, rags, gloves, goggles, absorbing compound, and plastic and metal trash containers specifically for this purpose.
- b. Manufacturer's recommended methods for spill cleanup will be clearly posted and site personnel will be made aware of the procedures and the location of information and cleanup supplies.
- c. All spills will be cleaned up immediately after discovery. Disposal of the waste from the spill shall be at the Contractor's expense and shall be coordinated with the Pollution Prevention Branch before removal or disposal.
- d. The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with a hazardous substance.
- e. All spills of toxic or hazardous materials will be reported to the Ft. Campbell Fire Department and PWBC Environmental through the Contracting Officers Representative who will report to the appropriate State or Local government agency if necessary.
- f. Once a spill has occurred, the spill prevention plan will be adjusted to include measures to prevent this type of spill from recurring with a discussion of the appropriate cleanup for that type of spill. Also, a description of the spill, what cleaned it, and the cleanup measures will be included.
- g. The prime Contractor will be responsible for the day-to-day site operations, including spill prevention and will designate an employee, by name, to be the primary cleanup coordinator.

Each subcontractor bringing more than 75 liters or 68 kilograms of a spillable substance shall also designate a cleanup coordinator. The cleanup coordinators will designate three (3) additional site personnel for spill prevention and cleanup.

h. Everyone will be trained in spill prevention and cleanup and shall know the primary cleanup coordinator and any additional site personnel to contact. Fort Campbell's Environmental Handbook (excerpt included below) will be the basis for spill prevention training.

(TAKEN FROM)

FORT CAMPBELL ENVIRONMENTAL HANDBOOK
Guidance and Instruction
SPILL PLANNING AND RESPONSE

Spill response equipment is a critical component of an effective response to an unexpected release of hazardous materials. Making an inventory of potential spots for emergency releases and having appropriate and sufficient spill response equipment to deal with those potential releases is required for each unit. Attachment 1 provides spill response materials minimum requirements.

SPILL PLANNING AND RESPONSE TRAINING REQUIREMENTS:

1) All personnel involved with the management and handling of oil and hazardous materials must be periodically trained in spill prevention and response. The training will be similar to the Hazardous Communication Program - Worker Right to Know and will include the following key features:

- a) Health effects of exposure to oil or hazardous materials;
- b) Applicable first aid procedures to be used following exposure;
- c) Personal Protective Equipment requirements and procedures for using equipment;
- d) Evacuation procedures;
- e) Spill material combustibility and potential for flash-back along vapor trails;
- f) Fire fighting procedures and special hazards of combustible products;

- g) Reactivity of spill material with common materials including water;
- h) Use and maintenance of all alarms and monitoring equipment associated with spill prevention or response;
- I) Initial Notification procedures;
- j) Site specific contingency plans;
- k) Location of posted Site Specific Spill Contingency Plan;
- l) Immediate spill response actions including location of pump controls and valves to stop spill flow; location and use of fire extinguishers, absorbents, neutralizing agents and other immediate spill response procedures;
- m) Visual inspections requirements of the particular areas; and
- n) Purpose and requirements of good housekeeping.

2) Spill response training exercises will be conducted once per year for personnel working at oil and hazardous material sites. Personnel entering one of these positions will be trained within two weeks after starting work and after any significant changes to the spill plan or training program. Records of the type, extent, and frequency of each individual's training will be maintained until closure of the applicable area or until three years after the date the individual last worked in the area. .

Refresher training shall be given with the Toolbox Safety Meetings and documented on the Quality Control Reports. Training shall cover what to do, and who to contact in case of a spill and what emergency action must be taken if any.

SPILL RESPONSE IS HANDLED BY FOUR DISTINCT OPERATIONS:

a) SPILL REPORTING

The first action to be taken in the event of a spill is to report the spill. If you observe a release of a hazardous material, report it to your supervisor and the Fire Department as required below. If the spill is in a Training Area, then the spill will be reported to Range Control, who will then notify the Fire Department. The Fire Department will notify PWBC Environmental Division and if required, Installation Safety, Emergency Medical,

and Preventative Medicine. The PWBC Environmental Division does all reporting to State/Federal Agencies.

The Fire Department (or Range Control) must be promptly notified of any of the following spills:

- (1) Any uncontrolled quantity of a hazardous substance, or if assistance is needed by Fire Department or Environmental Division, or as instructed by the MSDS or supervisor's discretion.

- (2) Oil and other petroleum products with quantity exceeding 10 gallons or area of spill greater than two feet in any direction or any amount that has spilled into a stream or body of water.

Environmental Division review has determined the material(s) listed requires special reporting at the quantity shown: (To be supplied by environmental staff during plan review.)

b. STOP OR CONTAIN THE SPILL

Assess the situation before attempting to contain any hazardous material spilled and proceed only if it is safe to do so. You must have knowledge of the spilled substance and don any required personal protective equipment. If necessary, make the spill scene off limits to any unauthorized personnel. If situation warrants, evacuate the area.

c. CLEAN UP THE SPILL

Under no circumstances should untrained and/or ill-equipped persons attempt to perform cleanup. In some instances, spill cleanup may require respiratory protection and other personal protective equipment. If it is within the capability of the unit that caused the spill, then that unit is responsible for its cleanup. Environmental Division will make the decision to obtain assistance and coordinate with other units as required. If you handle/work with the hazardous material as part of your job, you are to be trained and qualified to participate in the clean up of the spill. **All contractors must have an OSHA 1910.120 qualified spill response contractor available to respond to spills in 4 to 6 hours that require heavy equipment to remove contaminated soils/absorbents. Spill that cannot be removed because of response delays may need to be covered with heavy plastic and or secured to prevent further spread of contamination.**

d. DISPOSE OF SPILLED HAZARDOUS MATERIAL.

All spilled material and other contaminated material (soil, gravel, absorbents, etc.) must be properly disposed. It is the responsibility of the contractor that created the spill to properly package, dispose of the waste, and ensure the site is properly cleaned at no cost to the government. Some spill incidents may require cleanup, disposal, soil testing and a site closure report by an approved licensed environmental contractor approved by Fort Campbell. Environmental Division will determine the required cleanup and disposal method.

2.8 PRODUCT SPECIFIC PRACTICES

The following product specific practices will be followed on-site:

a. Petroleum Products - All vehicles will be periodically inspected for leaks and shall receive regular preventative maintenance to reduce the chance of leaks occurring. Petroleum products will be stored in tightly sealed containers which are clearly labeled. Bulk storage areas will be equipped with secondary containment appropriate for risk of loss from the primary container (s). Storage shall meet Federal, State and Local regulations. Secondary containment shall hold 150 % of the bulk amount stored over 19 liters. The Contractor will maintain a specific spill contingency and countermeasures plan for use in a bulk storage area.

b. Fertilizer - Fertilizers used will be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer will be worked into the soil to limit exposure to storm water. The contents of any partially used bags of fertilizer will be transferred to a sealable container to avoid spills.

c. Paints, Solvents, and Sealants - All containers will be tightly sealed and kept in the storage area when not in use. Any excesses of these materials will not be discharged into the storm sewer system, but will be properly disposed of according to manufacturer's instructions or State and Local regulations.

d. Concrete Trucks - Concrete trucks will be allowed to wash out, discharge surplus concrete and drum wash water only in a designated area. All wash water from the concrete trucks must

be retained on-site and treated according to Federal, State and Local regulations. Upon completion of the job, all discharges of surplus concrete and any soil contaminated by the concrete wash water will be removed from the site and taken to an approved disposal area. Water with the potential of entering sink holes or storm sewers will not be allowed to be discharged.

2.9 INSTALLATION/CONSTRUCTION

2.9.1 Inlet Protection

2.9.1.1 Fabric Drop Inlet Protection

- a. Construct a dike on the downslope side of the inlet to prevent runoff from bypassing. Dike should be 150 mm higher than inlet protection.
- b. Cut fabric from a single roll to avoid joints.
- c. Construct the fence as shown on in the drawings.
- d. Space the support posts evenly against the inlet perimeter a maximum of one (1) m apart, and drive them about 0.5 m into the ground.

2.9.1.2 Gravel Donut Inlet Protection

- a. Construct a dike on the downslope side of the inlet to prevent runoff from bypassing. Dike should be 150 mm higher than inlet protection.
- b. Construct as shown in the drawings.

2.9.1.3 Basket Curb Inlet

- a. Install immediately after a new inlet is placed or on existing inlets, before any land disturbing activity.
- b. If necessary, adapt basket dimensions to fit inlet box dimensions, see drawings.
- c. Remove the grate and place basket in the inlet.
- d. Cut and install a piece of filter fabric large enough to line the inside of the basket and extending a minimum of 150 mm beyond the frame.

- e. Replace the inlet grate, which also serves to anchor the fabric.

2.9.2 Silt Fence and Silt Fence Rock Overflow

- a. Construct as shown on the drawings.
- b. Staked and entrenched straw bales must be installed along the base of all fills and cuts and on the downhill sides of stockpiled soil.

2.9.3 Straw Bale Dam

- a. Construct as shown on the drawings.
- b. Staked and entrenched straw bales must be installed along the base of all fills and cuts and on the downhill sides of the stockpiled soil.

2.9.4 Seeding

- a. Test soil to determine its nutrient level or apply a 12-12-12 fertilizer at a rate of 75 to 110 kilograms per hectare.
- b. Work fertilizer into the soil 50 mm - 100 mm deep with a disk or rake operated across the slope.
- c. Select a seed mixture and application rate that best suits the soil type and climate. Also, consult the county soil, water conservation office for assistance.
- d. Apply seed uniformly with a drill or cultipacker seeder, or by broadcasting, and cover to recommended depth.
- e. If drilling or broadcasting, firm the seedbed with a roller or cultipacker.
- f. Mulch seeded area to increase seeding success.

2.9.5 Mulching

- a. Apply at the recommended rate based on the material being used.
- b. Spread uniformly with no more than 25% of the ground surface visible.
- c. If straw or hay is used, it must be anchored immediately.

2.10 INSPECTION AND MAINTENANCE

All measures that are being utilized will be inspected at least once each week and after each storm event. An inspection report shall be written after each inspection and submitted to the Contracting Office representative within 24 hours. Once a problem is found or sediment has reached the clean-out elevation, corrective action shall commence within 24 hours. Inspections shall continue until the controls are removed or the vegetative cover is firmly established.

PART 3 EXECUTION

3.1 GENERAL

The Contractor shall perform all work in such manner as to minimize the pollution of air, water, or land, and shall, within reasonable limits, control noise and the disposal of solid waste materials, as well as other pollutants. Information contained in the following specifications should also be referenced:

Section 02050	Demolition
Section 02080	Removal and Disposal of Asbestos Containing Materials
Section 02090	Demolition of Buildings with Lead Containing Paint

3.2 IMPLEMENTATION

Within 10 calendar days after Notice to Proceed and prior to commencement of the work at the site, the Contractor shall meet the representatives of the Contracting Officer to review and alter his proposal as needed for compliance with the environmental pollution control program.

3.3 PROTECTION OF LAND AREAS

Except for any work on storage areas and access routes specifically assigned for the use of the Contractor under this contract, the land areas outside the limits of permanent work performed under this contract shall, in accordance with CONTRACT CLAUSE: PROTECTION OF EXISTING VEGETATION, STRUCTURE, UTILITIES AND IMPROVEMENTS, be preserved in their present condition. Contractor shall confine his construction activities to areas defined for work on the plans or specifically assigned for his use. In accordance with CONTRACT CLAUSE: OPERATIONS AND STORAGE AREAS, storage and related areas and access routes required

temporarily by the Contractor in the performance of the work will be assigned by the Contracting Officer. No other areas on Government premises shall be used by the Contractor without written consent of the Contracting Officer.

3.4 PROTECTION OF TREES AND SHRUBS

CONTRACT CLAUSE: PROTECTION OF EXISTING VEGETATION, STRUCTURES, UTILITIES AND IMPROVEMENTS, is hereby supplemented as follows: The Contractor shall not deface, injure or destroy trees or shrubs, nor remove or cut them without special authority. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorage.

3.4.1 Tree Protective Structures

Where, in the opinion of the Contracting Officer, trees may possibly be defaced, bruised, injured or otherwise damaged by the Contractor's equipment or by his other operations, he may direct the Contractor to provide temporary protection of such trees by placing boards, plans, or poles around them.

3.4.2 Restoration of Damaged Trees

Any tree scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition at the Contractor's expense. All scars made on trees not designated on the plane to be removed by construction operations shall be coated as soon as possible with an approved tree wound dressing. Trees that are to remain, either within or outside established clearing limits, that are damaged by the Contractor so as to be beyond saving in the opinion of the Contracting Officer, shall be immediately removed, if so directed, and replaced with a nursery-grown tree of the same species and size.

3.5 PROTECTION OF WATER RESOURCES

The Contractor shall control the disposal of fuels, oils, bitumen, calcium chloride, acids, or harmful materials, both on and off the Government premises, and shall comply with applicable Federal, State, County and Municipal laws concerning pollution of rivers and streams while performing work under this contract. The contractor should note that the entire cantonment area is within the delineated Well Head Protection Area for Fort Campbell. This means any release in this area has the potential, due to the installations geological features to impact their drinking water

source. For this reason special measures need to be taken to prevent chemicals, fuels, oils, greases, bituminous materials, herbicides and insecticides from entering public waters or potentially migrating via sinkholes or other karst related geologic features to drinking water sources. Special measures will include the generation of a site-specific Spill Prevention Control and Countermeasures Plan. Water used in onsite material processing, concrete curing, foundation and concrete cleanup, and other waste waters shall not be allowed to reenter a stream if an increase in the turbidity of the stream could result therefrom.

3.6 BURNING

Air pollution restrictions applicable to this project are as follows. Materials shall not be burned on the Government premises. If the Contractor elects to dispose of waste materials off the Government premises, by burning, he shall make his own arrangements for such burning area and shall, as specified in CONTRACT CLAUSE: PERMITS AND RESPONSIBILITIES, conform to all local regulations.

3.7 DUST CONTROL

The Contractor shall maintain all excavations, stockpiles, access roads, waste areas, and all other work areas free from excess dust to such reasonable degree as to avoid causing a hazard or nuisance to the Using Service or to others. Approved temporary methods consisting of sprinkling, chemical treatment, or similar methods will be permitted to control dust. Dust control shall be performed as the work proceeds and whenever a dust nuisance or hazard occurs.

3.8 EROSION CONTROL

Surface drainage from cuts and fills within the construction limits, whether or not completed, and from borrow and waste disposal areas, shall be graded to control erosion within acceptable limits. Temporary control measures shall be provided and maintained until permanent drainage facilities are completed and operative. The area of bare soil exposed at any one time by construction operations should be held to a minimum.

3.9 CORRECTIVE ACTION

The Contractor shall, upon receipt of a notice in writing of any noncompliance with the foregoing provisions, take immediate corrective action. If the Contractor fails or refuses to comply

promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs of damages by the Contractor unless it was later determined that the Contractor was in compliance.

3.10 POST-CONSTRUCTION CLEANUP OR OBLITERATION

In accordance with CONTRACT CLAUSE: CLEANING UP, the Contractor shall, unless otherwise instructed in writing by the Contracting Officer, obliterate all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other vestiges of construction prior to final acceptance of the work. The disturbed areas shall be graded and filled and the entire area seeded.

3.11 PAYMENT

No separate payment or direct payment will be made for the cost of the work covered under this section, and such work will be considered as a subsidiary obligation of the Contractor.

-- END OF SECTION --

[Return to designer instructions](#)

FTCKY HAZMAT INVENTORY FORM

Date: ____/____/____

Ft. Campbell Environmental Division/Pollution Prevention Branch/ 798-3105

Page ____ of ____

Unit (Bde, Bn, Co.): _____ Bldg #: _____ State: _____ POC Name: _____ Phone #: _____

Bldg Description: _____ HazMat Storage Location: _____
(ie. motor pool, aviation hangar, supply room, etc.) (i.e. flammable wall locker, supply closet, etc.)

NSN (If unknown, attach MSDS)	Manufacturer	Material Name	Material Use	Expire Date	Disposal Procedure	Containers On Hand	Weight or Volume Per Container	Amount Used Per Month (Approximate)
<i>Example:</i> 6810-00-281-2785	CSD Inc.	MEK	Degreaser	12-99	Hazardous Waste Disposal	1 Can	1 Gal.	1Gal.

Construction Activity Water Permitting Requirements Contractor's Signature Form

State of Tennessee
Department of Environment and Conservation
Rule 1200-4-10.05
Division of Water Pollution Control
NPDS General Permit TNR 100000

To be completed by developer:
NOI Submission Date: _____

Project Name: _____

Project Location: _____
County _____

I have agreed to perform construction-related professional services,
described as:

_____ that will likely impact the nature of storm water runoff from the named
construction activity. Erosion control services involve primarily:

- _____ Prepare erosion control plan
- _____ Inspection of controls
- _____ Install, maintain erosion and sediment controls
- _____ Other

I understand the terms and conditions of Rule 1200-4-10.05 and that I, and my
company, as the case may be, are responsible for the legally liable for
complying with this Rule and the applicable State and Federal Laws. I
understand that State or EPA or private actions may be taken against me if
the terms and conditions of the Rule are not met.

Printed Name: _____ Title: _____

Signature: _____ Date: _____

Company Name: _____

Address: _____

City: _____ State: _____ Phone No. _____

Field Person in charge: _____ Phone No. _____

Owner/Developer: I certify that the above has been retained to perform the
described construction related services noted above and as outlined in the
referenced NOI.

Signature: _____ Date: _____

-- End of form --

[Back to Paragraph 2.4](#)

August 17, 1998

FORT CAMPBELL CONTRACTOR SITE SPECIFIC SPILL
CONTINGENCY PLAN

NAME: _____

CONTRACT NUMBER: _____

GENERAL DISCRIPTION OF WORK: _____

1. RESPONSIBLE PERSONS

A. PRIMARY PERSON

Name: _____ TITLE: _____

Work Phone: _____ Home Phone: _____

B. ALTERNATE PERSON

Name: _____ TITLE: _____

Work Phone: _____ Home Phone: _____

C. SECOND ALTERNATE PERSON

Name: _____ TITLE: _____

Work Phone: _____ Home Phone: _____

2. SPECIAL PRECAUTIONARY MEASURES FOR BUILDING(S) AND ASSOCIATED AREAS

If more than one building, Specify hazardous materials for those buildings.

Building (S) # _____

- A. Avoid contacts with spilled substances.
- B. Refer to Material Safety Data Sheets (MSDS) for particular hazards and precautionary measures for special handling and spill procedures. Flammable materials will be extinguished as to local fire regulations and the material safety data sheets. If needed, list any materials that need special handling, PPE or special precautionary measures.

3. EMERGENCY SPILL EQUIPMENT ON HAND

(For example, sweeping compound and absorbent material, brooms and plastic dust pans, emergency spill kits, non-sparking shovels, other items as needed and required)

BUILDING#: _____ BUILDING#: _____

4. HAZARDOUS MATERIAL AND QUANTITY NORMALLY ON HAND

A. Attach a listing of Hazardous Materials on hand, using the FTCKY HAZMAT Inventory Form.

B. Material Safety Data Sheets are readily available and located at (the specific location is required).

Bldg. #: _____

Bldg. #: _____

5. SPILL RESPONSE AND NOTIFICATION PROCEDURES

A. REPORT THE SPILL.

The first action in the event of a spill is to report the spill. If you observe a release of a hazardous material, report it to your supervisor and the Fire Department as required below. If the spill is in a Training Area, then the spill will be reported to Range Control, who will then notify the Fire Department. The Fire Department will notify Environmental Division and, if required, Installation Safety, Emergency Medical, and Preventative Medicine. The Environmental Division does all reporting to State/Federal Agencies.

The Fire Department (or Range Control) must be promptly notified of any of the following spills:

- Any uncontrolled quantity of a hazardous substance, or if assistance is needed by Fire Department or Environmental Division, or as instructed by the MSDS or supervisor's discretion:
- Oil and other petroleum products with quantity exceeding 10 gallons or area of spill greater than two feet in any direction or any amount that is spilled into a stream or body of water.
- Environmental Division review has determined the material(s) listed requires special reporting at the quantity shown: (To be supplied by environmental staff during plan review.)

Name: _____ Quantity _____

Name: _____ Quantity _____

Name: _____ Quantity _____

Signature of Environmental Division staff: _____

SUPERVISOR (to notify in case of spill)

NAME: _____ TITLE: _____
WORK PHONE: _____ HOME PHONE: _____

FIRE DEPARTMENT: phone 911

RANGE CONTROL: phone (270) 798-3001 or on radio frequency FM 49.95

ENVIRONMENTAL phone (270) 798-3105

1. If required by your **ORGANIZATION**, additional people to be notified within your chain of command: If not required, fill in N/A.

ALTERNATE PERSON

NAME: _____ RANK: _____
WORK PHONE: _____ HOME PHONE: _____

ALTERNATE PERSON

NAME: _____ RANK: _____
WORK PHONE: _____ HOME PHONE: _____

The spill report must include the following information:

- Name/Phone/Unit of individual reporting the spill; _____
- Spill (Building Location of Number, etc.); _____
- Name of spilled material; _____
- Amount spilled; _____
- Rate currently spilling; _____
- Extent of spill, including drainage features; _____
- Injuries, if any; _____
- Time spill occurred; _____
- Any additional information. _____

B. STOP OR CONTAIN THE SPILL.

Assess the situation before attempting to contain any hazardous material spilled and proceed only if it is safe to do so. You must have knowledge of the spilled substance and don any required personal protective equipment. If necessary, make the spill scene off limits to any unauthorized personnel. If situation warrants, evacuate the area.

C. CLEAN UP THE SPILL.

Under no circumstances should untrained and/or ill-equipped persons attempt to perform cleanup. In some instances, spill cleanup may require respiratory protection and other personal protective equipment. If it is within the capability of the unit that caused the spill, then that unit is responsible for its cleanup. Environmental Division will make the decision to obtain assistance and coordinate with other units as required.

If you handle/work with the hazardous material as part of your job, you are to be trained and qualified to participate in the clean up of the spill.

D. DISPOSE OF SPILLED HAZARDOUS MATERIAL.

All spilled material and other contaminated material (soil, gravel, absorbents, etc.) must be properly disposed. It is the responsibility of the unit that created the spill to properly package and dispose of the waste. Environmental Division will determine the required disposal method.

Responsible Person Signature and Date

[Back to Paragraph 2.7](#)

[Return to designer instructions](#)

CHAPTER 3

Division 01000

Technical Requirements and Instructions

SECTION 01572 - 01670

Construction and Demolition Waste Removal/Diversion Recycle of Recovered Materials

Ft. Campbell Requirements:

Requirements in this section and Appendix A-7. [Solid Waste Disposal/Diversion Practices](#) shall apply to all construction and demolition activities at Fort Campbell. Contract specifications shall require at least a 40% diversion of demolished building materials such as wood, plumbing fixtures, electrical materials (lights and panels), windows, doors, toilet partitions, HVAC equipment, and scrap metals be diverted from the landfill. Diversion can be accomplished by deconstructing the wood buildings and components per instructions below or by moving the structure off-post.

Demolition materials shall not be salvaged by the contractor and shall not be removed from the installation. Non salvageable demolition materials shall not to be transported off the installation.

Notify the PWBC Environmental Division if unknown waste is discovered during site investigations. Waste could be explosive, hazardous or toxic waste.

Dumpster service for new construction and for demolition is not provided by the installation. The contractor shall arrange for dumpster service at the Contractor's own expense.

In general, utilities are not to be abandoned in place; all abandoned utilities are to be removed. There are circumstances where this requirement does not apply. Abandonment of utilities and removal shall be a topic of discussion at design conferences.

Instructions to Designers:

- 1 Modify UFGS 01572 - 01670 paragraphs to include the building demolition/diversion requirements above and modify contract specifications.

- 2 Construction specifications shall require a Building Materials Diversion Plan to be submitted and approved by PWBC.
- 3 When a project requires removal/disposal of environmentally hazardous waste generated at Fort Campbell, the PWBC Environmental Division must be involved in the permitting process. Modify project drawings and specifications paragraphs to include each of the above features as they apply to the project. Additional guidance on Environmental Requirements and Hazardous Waste Disposal Practices is contained in [Appendix A](#), and project specifications shall be modified to indicate these requirements.
- 4 For mercury containing light bulb disposal, insert the [Mercury Light Bulb](#) paragraph.

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CHAPTER 3

Technical Requirements and Instructions

Division 02000

Section

02080	<u>Removal and Disposal of Asbestos Containing Materials</u>
02090	<u>Removal and Disposal of Lead Containing Materials</u>
02220	<u>Demolition</u>
02226	<u>Removal and Salvage of Historic Building Materials</u>
02315 - 02316	<u>Excavation, Filling and backfilling</u>
02364	<u>Termiticide Treatment Measures for Subterranean Termite Control</u>
02510	<u>Water Distribution System</u>
02531-02532	<u>Sanitary Sewers</u>
02556	<u>Gas Distribution System</u>
02630	<u>Storm-Drainage System</u>
02744-02745	<u>Bituminous Roadways</u>
02753-02754	<u>Concrete Pavements</u>
02770	<u>Concrete Sidewalks and Curbs and Gutters</u>
02930	<u>Exterior Planting</u>

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CHAPTER 3

Division 02000

Technical Requirements and Instructions

SECTION 02080

Removal and Disposal of Asbestos Containing Materials

Ft. Campbell Requirements:

Removal and disposal of asbestos containing shall be conducted in accordance with Ft. Campbell specification section 02080, Removal and Disposal of Asbestos Containing Materials, which shall be included in all projects containing or possibly containing Asbestos products.

Friable and non-friable asbestos to be removed from buildings before demolition.

Contractors must abide with the asbestos regulations in order for the asbestos to be accepted at the Woodlawn Landfill. These procedures include proper notification, manifesting, documentation, vehicle marking, unloading and PPE.

Many contractors depend on refuse contractors to transport the asbestos waste, and their personnel accompanying the asbestos do not normally have asbestos knowledge or training. Therefore, those delivering the materials to the landfill must have proof of medical surveillance and proper PPE.

Instruction to Designers:

1. Asbestos studies have been completed for numerous existing buildings and facilities at Fort Campbell. Designers shall investigate and review the data as required to insure proper identification and notification of asbestos presence at planned OMA and MILCON projects. These studies are available for inspection at the PWBC Maintenance Division. POC is Ted Reese at 270-798-8987.
2. All projects containing or possibly containing Asbestos products shall include [Ft. Campbell specification section 02080, Removal and Disposal of Asbestos Containing Materials](#)
3. Additional Environmental guidance applies. See [Appendix A](#).
4. For electronic copies of the document, contact the PE/A for MILCON and OMA projects by the COE. A-E's directly serving the installation should contact the PM

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Ft. Campbell Specification

Section 02080, Removal and Disposal of Asbestos Containing Materials

SECTION 02080

REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS

11/97

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI) PUBLICATIONS:

ANSI Z9.2-79	Fundamentals Governing the Design and Operation of Local Exhaust Systems
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CODE OF FEDERAL REGULATIONS (CFR) PUBLICATIONS:

40 CFR 61, Subpart A	General Provisions
40 CFR 61, Subpart M	National Emission Standard for Asbestos
40 CFR 241 Solid Wastes	Guidelines for the Land Disposal of
40 CFR 257 Waste	Criteria for Classification of Solid Disposal Facilities and Practices
29 CFR 1926.1101 Asbestos Standard	OSHA Construction Industry
29 CFR 1910.120 Emergency Response	OSHA Hazardous Waste Standard
29 CFR 1910 subpart I	OSHA Personal Protective Equipment Standard

NATIONAL INSTITUTE OF OCCUPATIONAL SAFETY AND HEALTH

Method 7400	Manual of Analytical Methods, 3rd
Ed., Vol. 1,	Physical and Chemical Analysis Method
	(P&CAM) Fibers
Method 7402	Asbestos Fibers

UNDERWRITERS LABORATORIES, INC. (UL) PUBLICATIONS

UL 586	1986 High Efficiency Particulate, Air
Filter	

1.2 DESCRIPTION OF WORK

The work covered by this section includes the handling of friable and nonfriable asbestos containing materials (ACMs) which may be encountered during removal and demolition operations and the incidental procedures and equipment required to protect workers and occupants of the building or area, or both, from contact with airborne asbestos fibers. The work also includes the disposal of the removed asbestos-containing materials. Perform work in accordance with 29 CFR 1926.1101; 40 CFR 61, Subpart A; 40 CFR 61, Subpart M; and the requirements specified herein.

Please refer to pages B20-B38 of the Detail drawings, Volume 1 of 7 for specific locations and quantities of asbestos containing materials.

Please see drawing TU 1.0 for locations of underground chilled water lines, steam lines and condensate lines which are insulated with asbestos containing materials. A total of 6002 linear feet (1850m) are assumed to be present. The breakdown of the piping is as follows:

100 mm (4") chilled water supply	- 425 m (1361 ft)
100 mm (4") chilled water return	- 425 m (1361 ft)
150 mm (6") steam	- 350 m (1148 ft)
125 mm (5") steam	- 150 m (492 ft)
80 mm (3") condensate	- 250 m (820 ft)
50 mm (2") condensate	- 250 m (820 ft)

In addition two cooling towers located at buildings 6775 and 6781 are composed of transite panels and have interiors that contain a honey combed fill material which contains asbestos. An estimated total of 160 square feet of asbestos containing materials are present in each of the two units.

1.2.1 Asbestos Survey

An asbestos Survey was conducted in the contract work area(s) to identify the presence of asbestos containing materials as described in 1.2 above. The data collected is contained in the Asbestos and Lead-Based Paint Survey Report for the Third Brigade Barracks, Fort Campbell, Kentucky , prepared by Gobbel Hays Partners, which is on file at the Fort Campbell PW, Environmental Division. Contact must be made through the Contracting officer.

1.2.2 Unidentified ACM

If suspect ACM not covered by the drawings or the specifications is encountered, the contractor will stop work and immediately notify the contracting officer. Upon direction from the contracting officer, the contractor may be required to conduct sampling and testing of these suspect materials in accordance with the Industrial Hygienist's recommended procedures.

1.3 DEFINITIONS

1.3.1 Aggressive method

Removal or disturbance of building material by sanding, abrading, grinding or other method that breaks, crumbles, or disintegrates intact Asbestos Containing Material (ACM).

1.3.2 Amended Water

Water containing a wetting agent or surfactant.

1.3.3 Area Monitoring

Sampling of asbestos fiber concentrations inside and out of the regulated area, which is representative of the airborne concentrations of asbestos fibers which may reach the breathing zone.

1.3.4 Asbestos

Includes chrysotile, amosite, crocidolite, tremolite , anthophyllite, actinolite, and any of these minerals that have been chemically treated and/or altered. For purposes of this standard, "asbestos" includes PACM, as defined below.

1.3.5 Asbestos Abatement Contractor

A business entity certified, licensed, or accredited by the state in which a response action involving asbestos-containing building material that is friable, or expected to become friable during the response action.

1.3.6 Asbestos Containing Material (ACM)

Any material containing more than one percent asbestos

1.3.7 Asbestos Fibers

Asbestos fibers having a length-to-diameter ratio of at least 3 to 1 and a length of 5 micrometers or longer as counted in the NIOSH Method 7400 or Method 7402 procedure using either phase contrast light microscopy (PCM) or transmission electronic microscopy (TEM).

1.3.8 Asbestos Permissible Exposure Limit (PEL)

Legally enforceable level of asbestos fibers in air set by the Occupational Safety and Health Association (OSHA), as an eight (8) hour time weighted average (TWA) of asbestos fibers not to exceed 0.1 fibers per cubic centimeter of air as set forth in 29 CFR 1926.1101

1.3.9 Authorized Person

Any person authorized and required by work duties to be present in regulated areas.

1.3.10 Breathing Zone

A hemisphere forward of the shoulders with a radius of approximately 6 inches to 9 inches.

1.3.11 Category I Nonfriable ACM

Category I Nonfriable ACM includes asbestos-containing packing, gaskets, resilient floor covering, and asphalt roofing products.

1.3.12 Category II Nonfriable ACM

Category II Nonfriable ACM includes any asbestos-containing material not included in Category I that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.

1.3.13 Certified Asbestos Supervisor

One certified by the State in which work is to be performed and has passed an examination covering "Supervision of Asbestos Abatement Projects" or similar title training. This training must be the equivalent in curriculum, training, method and length to the EPA Model Accreditation Program (MAP) asbestos abatement workers training 40 CFR part 763 subpart E, Appendix C.

1.3.14 Certified Asbestos Worker

One certified by the National Asbestos Council and holds current cards illustrating the board number.

1.3.15 Certified Licensed Contractor

A Contractor who has been trained at an EPA approved course and certified/accredited by the state for which the work is to be performed in.

1.3.16 Certified Industrial Hygienist (CIH)

One certified in the comprehensive practice of industrial hygiene by the American Board of Industrial Hygiene.

1.3.17 Class I Asbestos Work

Activities involving the removal of Thermal System Insulation (TSI) and surfacing ACM and PACM.

1.3.18 Class II Asbestos Work

Activities involving the removal of ACM which is not thermal system insulation or surfacing material. This includes, but it not limited to, the removal of asbestos-containing wallboard, floor tile, sheeting, roofing, siding shingles, and construction mastics.

1.3.19 Class III Asbestos Work

Repair and maintenance operations, where "ACM, including thermal system insulation and surfacing material, is likely to be disturbed.

1.3.20 Clean Room

An uncontaminated, transitional room having facilities for storage of employees' street clothing and uncontaminated materials and equipment.

1.3.21 Competent Person

In addition to the definition in 29 CFR 1926.32(f), one who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure and has the authority to take prompt corrective measures to eliminate them, as specified in 29 CFR 1926.32 (f); in addition, for Class I and Class II work, one who is specially trained in a training course which meets the criteria of EPA's Model Accreditation Plan (40 CFR 763) for project designer or supervisor, or its equivalent and, for Class II who is trained in an operations and maintenance (O&M) course developed by EPA (40 CFR 763 . 92 (a)(2)).

1.3.21 Critical Barrier

One or more layers of plastic sealed over all openings into a work area or any other similarly placed physical barrier sufficient to prevent airborne asbestos in work area from migrating to an adjacent area.

1.3.23 Decontamination Area

An enclosed area adjacent and connected to the regulated area and consisting of an equipment room, shower area, and clean room which is used for the decontamination of workers, materials and equipment contaminated with asbestos.

1.3.24 Demolition

The wrecking or taking out of any load-supporting structural member and any related razing, removing, or stripping of asbestos products.

1.3.25 Disturbances

Contact which releases fibers from ACM or PACM or debris containing ACM or PACM. This term includes activities that disrupt the matrix of ACM or PACM, render ACM or PACM friable, or generate visible debris. Disturbance includes cutting away small amounts of ACM and PACM, no greater than the amount which can be contained in one standard sized glove bag or waste bag in order to access a building component. In no event will the amount of ACM or PACM so disturbed exceed that which can be contained in one glove bag or waste bag which will not exceed 60 inches in length and width.

1.3.26 Employee Exposure

That exposure to airborne asbestos fibers that would occur if the employee were not using respiratory protective equipment.

1.3.27 Encapsulant

A liquid material which can be applied to ACM which controls the possible release of asbestos fibers from the material either by creating a membrane over the surface (bridging encapsulant) or by penetrating into the material and binding its components together (penetrating encapsulant).

1.3.28 Encapsulate

The process where by an encapsulant is applied to ACM to control the release of asbestos fibers into the air.

1.3.29 Equipment Room (Change Room)

A contaminated room located within the decontamination area that is supplied with impermeable bags or containers for the disposal of contaminated protective clothing and equipment.

1.3.30 Excursion Limit

The contractor will ensure that no employee is exposed to an airborne concentration of asbestos in excess 1.0 fibers per cubic centimeter of air (1.0 f/cc) as averaged over a sampling period of 30 minutes.

1.3.31 Fiber

A particulate form of asbestos, 5 micrometers or longer, with a length-to-diameter ratio of at least 3 to 1.

1.3.32 Friable Asbestos Material

Material that contains more than one percent asbestos by weight which can be crumbled, pulverized, or reduced to powder by hand pressure when dry.

1.3.33 Glovebag Technique

A method with limited applications for removing small sections of asbestos-containing material from HVAC ducts, short piping runs, valves, joints, elbows, and other nonplanar surfaces in a noncontained regulated area. The glovebag is constructed and installed in such a manner that it surrounds the object or material to be removed and contains all asbestos fibers released during the removal process. All workers who are permitted to use the glovebag technique must be highly trained, experienced and skilled in this method. Glovebag techniques must be performed in accordance with 29 CFR 1926.1101 which require at least two persons perform class I removals. Glovebags may not be moved along a piece of pipe.

1.3.34 Glovebag

An impervious plastic bag-like enclosure affixed around an asbestos-containing material, with glove-like appendages through which material and tools may be handled. Glovebags will be made of 6 mil thick plastic and will be seamless at the bottom. Glovebags are for single use and must be smoke tested for leaks prior to usage.

1.3.35 HEPA Filter Equipment

High-efficiency particulate air (HEPA) filtered vacuuming equipment with a UL 586 filter system capable of collecting and retaining at least 99.97 percent of all mono-dispersed particles of 0.3 micrometer diameter or larger.

1.3.36 Homogeneous Area

An area of surfacing material or thermal system insulation that is uniform in color and texture.

1.3.37 Intact

ACM which has not been crumbled, pulverized, or otherwise deteriorated so that it is no longer likely to be bound with its matrix.

1.3.38 Negative Initial Exposure Assessment

A demonstration based by the contractor , which complies with the criteria in paragraph (f)(2)(iii) of 29 CFR 1926.1101, that employee exposures during an operation are expected to be consistently below the PELs.

1.3.39 Nonfriable Asbestos Material

Material that contains asbestos in which the fibers have been locked in by a bonding agent, coating, binder, or other material so that the asbestos is well bound and may not release fibers in excess of the action level during any appropriate use, handling, storage, transportation, or processing. Nonfriable asbestos containing material must be removed prior to demolition/renovation. Nonfriable asbestos containing materials are to be disposed as special waste at a state permitted subtitle D landfill approved to accept asbestos..

1.3.40 Presumed Asbestos Containing Material (PACM)

Thermal system insulation and surfacing material found in buildings constructed no later than 1980.

1.3.41 Personal Monitoring

Sampling of airborne asbestos fiber concentrations within the breathing zone of an employee.

1.3.42 Prior Experience

Experience required of the contractor, his employees, and his Industrial Hygienist on asbestos projects of similar nature and scope to insure capability of performing the asbestos removal in a satisfactory manner. Similarities will be in areas related to material composition, project size, number of employees and the engineering work practice and personal protection controls required.

1.3.43 Regulated Areas

Areas established to demarcate where Class I, II and III asbestos work is conducted, and any adjoining area where debris and waste from such asbestos work may accumulate; and a work area within which airborne concentrations of asbestos, exceed or there is a reasonable possibility they may exceed the permissible exposure limit.

1.3.43.1 Enclosed Regulated Area

A regulated area which has been isolated by physical boundaries and maintained under negative pressure to prevent the spread of asbestos dust, fibers, or debris. A local HEPA filtered exhaust system is required.

1.3.44 Regulated Asbestos-Containing Material (RACM) for abatement at Fort Campbell will include the following:

- (a) Friable asbestos containing material
- (b) All category I nonfriable ACM
- (c) All category II nonfriable ACM

1.3.45 Thermal System Insulation (TSI)

ACM applied to pipes, fittings, boilers, breeching, tanks, ducts or other structural components to prevent heat loss or gain.

1.3.46 Thermal System Insulation ACM

Thermal system insulation which contains more than 1 percent asbestos.

1.3.47 Time Weighted Average (TWA)

The TWA is an individuals 8-hour time weighted average of airborne concentration of fibers per cubic centimeter of air.

1.4 SUBMITTALS

The following will be submitted in accordance with Section 01300 SUBMITTALS to and approved by the contracting officer prior to commencing work involving asbestos materials:

1.4.1 SD-01, Data

1.4.1.1 Local Exhaust Equipment;

1.4.1.2 HEPA Vacuum Equipment;

1.4.1.3 Respirators; including fit test records

1.4.1.4 Pressure Differential Monitor;

1.4.1.5 Hazardous Communication Plan (if hazardous materials will be brought onto site)

1.4.1.6 Training Data

Submit signed and dated certificates for each employee that has received training for the appropriate task(s) assigned and the required amount of hours for the proper handling of materials that contain asbestos, that the employee understands the health implications and risks involved, including the illnesses possible from exposure to airborne asbestos fibers; understands the use and limitations of the respiratory equipment to be used; understands the results of monitoring of airborne quantities of asbestos as related to health and respiratory equipment; and understands engineering and other hazard control techniques and procedures.

1.4.2 SD-08 Statements

1.4.2.1 Testing Laboratory;

Submit the name, address, and telephone number of the testing laboratory selected to perform the monitoring, testing, and reporting of airborne concentrations of asbestos fibers. The laboratory will be approved by the American Industrial Hygiene Association (AIHA) to participate in the AAR program. Submit proof that persons reading the samples have been judged proficient by successful participation within the last year in the National Institute for Occupational Safety and Health (NIOSH) Proficiency Analytical Testing (PAT) Program or proof that the individuals reading the air samples are current participants in the Asbestos Analysts Registry (AAR). If bulk sample analysis is necessary the testing laboratory will have to submit their certification of National Laboratory Accreditation Program (NVLAP) participation.

1.4.2.2 Industrial Hygienist;

Submit the name, address, and telephone number of the Industrial Hygienist selected to prepare the asbestos plan, direct monitoring and perform training, and a certification that the Industrial Hygienist is certified by the American Board of Industrial Hygiene, including certification number, and date, and their previous experience in asbestos removal activities. For the purposes of this specification the terms industrial hygienist, Certified Industrial Hygienist and CIH are synonymous. The industrial hygienist will be contracted by the abatement firm performing the work. In addition to being a CIH, the individual must be accredited in the discipline he is performing. The Industrial Hygienist must be an accredited building inspector if he is to collect samples or an accredited designer if he is to perform asbestos design specifications.

1.4.2.3 Prior Experience;

As evidence that the asbestos removal effort will be accomplished by trained and competent personnel totally familiar with safe and legal asbestos working practices, the contractor will furnish for Government approval (for himself or for his selected asbestos removal subcontractor) written documentation of successfully completed asbestos abatement projects of similar nature and scope. A short summary of three (3) asbestos abatement projects performed will include:

- a. The name, address, and telephone number of the contact person (someone specifically familiar with the contractor's work). If available, include copies of letters of reference from previous users of the contractor's service.
- b. A short description of the type of removal (e.g. pipe lagging, sprayed girders and/or ceilings, transite siding, etc.), its extent (square feet, linear feet), and days to complete (scheduled and actual).
- c. Documentation of any licenses or certifications as an asbestos abatement Contractor in the jurisdiction covered. If none, a negative response is required.
- d. The contractor will certify that the firm and its employees are familiar with regulations of the Occupational Safety and Health Administration (OSHA) and the U.S. Environmental Protection Agency (EPA) cited in the project specification and related to asbestos abatement.

e. The contractor will further document that no RACM will be stripped, removed , or otherwise be handled or disturbed unless at least one on-site representative, such as a foreman, management level, or other authorized representative trained in the provisions of this regulation and the means of complying with them, is present. Annually the trained on-site individual will receive refresher training in the provisions of this regulation. The required training will include as a minimum: applicability; notifications; material identification; control procedures for removals including, at least, wetting, local exhaust ventilation, negative pressure enclosures, glove-bag procedures, and High Efficiency Particulate Air (HEPA) filters; waste disposal work practices; reporting and record keeping; and asbestos hazards and worker protection. Evidence that the required training has been completed will be posted and made available for inspection by the NESHAP administering agency at the demolition or renovation site.

f. A notarized statement, signed by an officer of the asbestos abatement company, containing the following information: (If none, a negative reply is required.)

(1) A record of any citations issued by Federal, State or local: regulatory agencies relating to asbestos abatement activity. Include projects, dates and resolutions.

(2) A list of penalties incurred through noncompliance with asbestos abatement project specifications including liquidated damages, overruns in scheduled time limitations and resolutions

(3) Situations in which an asbestos related contract has been terminated including projects, dates and reasons for terminations.

(4) A listing of any asbestos-related legal proceedings/claims which the contractor (or employees Scheduled to participated in this project) has participated or is currently involved. Include descriptions of role, issue and resolution to date.

1.4.2.4 Asbestos Plan;

Submit a detailed Plan of the work procedures to be used in the removal and disposal of materials containing asbestos. Include in the Plan an explanation of Initial Exposure Assessment. The

Plan will be prepared, signed, and sealed, including certification number and date, by the contractor's Certified Industrial Hygienist. Such Plan will include a sketch showing the location, size, and details of regulated areas, location and details of the decontamination area, layout of decontamination area, and locations of local exhaust equipment. The Plan will also include interface of trades involved in the construction, sequencing of asbestos-related work, disposal plan, type of wetting agent to be used, air monitoring, respirators, protective equipment, pressure differential monitoring device, and a detailed description of the method employed in order to control ambient air conditions within the regulated area. All milestones and schedules will be included within this Plan. The Plan will be approved by the contracting officer prior to the start of any asbestos work. Prior to beginning work, the contractor will meet with the contracting officer to discuss in detail the Asbestos Plan, including work procedures and safety precautions.

1.4.2.5 Notification Requirements;

a. Initial Notification

At least 10 working days before asbestos stripping or removal work or any other activity begins such as site preparation that would break up, dislodge or similarly disturb asbestos containing materials.

The contractor will:

(1) Provide the U.S. Environmental Protection Agency (EPA) Regional NESHAP administering agency with the required notice of intention to demolish or renovate. Notification shall be in accordance with State of Tennessee regulation Ch 1200-3-11 and Code of Federal Regulations 40 CFR 61, Subpart M. The contractor will send notification forms to the Department of Environment and Conservation-Division of Air Pollution Control, 9th Floor, L&C Annex, 401 Church Street, Nashville, Tennessee 37243-1531. A Tennessee 'Notification of Asbestos Demolition or Renovation' [form is located at the end of this section](#). Work will not commence on any dates other than those stated in the notification without re-notification of all parties. Delivery of the notice by U.S. Postal Service, commercial delivery service, or hand delivery is acceptable. The contractor will also provide the Contracting Office representative copies of all notifications and re-notifications.

(2) Update notice, as necessary, including when the amount of asbestos affected changes by at least 20 percent.

b. Re-notification

For asbestos stripping or removal work in a demolition or renovation operation that will begin on a date other than the one contained in the original notice, notice of the new start date must be provided to the NESHAP-administering agency as follows:

(1) When the asbestos stripping or removal operation or demolition operation covered by this paragraph will begin after the date contained in the notice,

(a) Notify the NESHAP administering agency of the new start date by telephone as soon as possible before the original start date, and

(b) Provide the NESHAP administering agency with a written notice of the new start date as soon as possible before, and no later than, the original start date. Delivery of the updated notice by the U.S. Postal Service commercial delivery service, or hand delivery is acceptable.

(2) When the asbestos stripping and removal operation or demolition operation covered by this paragraph will begin earlier than the original start date, provide the NESHAP administering agency with a written notice of the new start date at least 10 working days before asbestos stripping or removal work begins.

(3) In no event will an operation covered by this paragraph begin on a date other than the date contained in the written notice of the new start date.

c. Notification Information

The following will be included in the notice:

(1) An indication of whether the notice is the original or a revised notification.

(2) Name, address, and telephone number of both the facility owner and operator and the asbestos removal contractor.

(3) Type of operation: demolition or renovation.

(4) Address including specific building number and description of the facility or affected part of the facility including the size (square meters/square feet and number of floors), age, and prior use of the facility.

(5) Procedure, including analytical methods, employed to detect the presence of RACM and Category I and Category II nonfriable ACM.

(6) Estimate of the approximate amount of RACM to be removed from the facility in terms of length of pipe in linear meters (linear feet), surface area in square meters (square feet) on other facility components, or volume in cubic meters (cubic feet).

(7) Location of the facility being demolished or renovated.

(8) Scheduled start and completion dates of demolition or renovation.

(9) Description of planned demolition or renovation work to be performed and method(s) to be employed, including demolition or renovation techniques to be used and description of affected facility components.

(10) Description of work practices and engineering controls to be used to comply with the requirements of this subpart, including asbestos removal and waste-handling emission control procedures.

(11) Name and location of the waste disposal site where the asbestos-containing material will be deposited.

(12) A certification that at least one person trained as required by paragraph (e) of 1.4.2.3 of this section will supervise the stripping and removal described by this notification.

(13) Description of procedures to be followed in the event that unexpected ACMs are encountered.

(14) Name, address, and telephone number of the waste transporter.

1.4.3.1 Monitoring Results;

Fiber counting will be completed and results reviewed by the Certified Industrial Hygienist within 16 hours. The CIH will notify the contractor and the contracting officer immediately of any exposures to fibers in excess of the acceptable limits. Submit monitoring results to the contracting officer within 3 working days, signed by the testing laboratory, the employee performing air monitoring and the CIH.

1.4.3.2 Local Exhaust System;

Local exhaust systems must be installed and operated in accordance with ANSI Z9.2-79. The local HEPA filtered exhaust system will be operated continuously, 24 hours a day, to maintain the enclosure under negative pressure until the enclosure of the regulated area is removed. Pressure differential recordings for each workday will be reviewed by the Industrial Hygienist and submitted to the contracting officer within 24 hours from the end of each workday. The contractor will notify the contracting officer immediately of any variance in the pressure differential which could cause exposure of adjacent unsealed areas to asbestos fiber concentrations.

1.4.3.3 Job Progress Report;

During abatement activities, the Industrial Hygienist will submit a weekly job progress report to the contracting officer detailing abatement activities. Include review of progress with respect to Asbestos Plan, milestones and schedules, major problems and actions taken, injury reports, equipment breakdowns and a compilation of the weeks bulk material and air sampling results conducted by the contractor's Industrial Hygienist or air sampling professional. Submission of individual monitoring results will be as dictated by SD-09, Reports. The progress report will be signed by the contractor, asbestos abatement subcontractor and the Industrial Hygienist.

1.4.4 SD-13, Certificates

1.4.4.1 Local exhaust and HEPA vacuum filters;

Local exhaust and HEPA vacuum filters need to be maintained as per manufacturers specifications. Asbestos prefilters need to be replaced daily and HEPA filters changed based upon daily readings of the manometer as described in section 2.7 of this specification.

1.4.4.2 Respirators;

Respiratory protection will be provided by the contractor according to 29 CFR 1926.1101 and the requirements specified in section 2.2 of this specification. The contractor will have developed and implemented a respiratory protection program meeting all the requirements of 29 CFR 1910.134 OSHA's Respiratory Protection Standard.

1.4.5 SD-18, Records

1.4.5.1 Landfill Delivery Records;

Submit written evidence that the contractor plans to use the Woodlawn Landfill for disposal and will follow all approved procedures for asbestos disposal issued by the EPA, state and local regulatory agencies. Submit copies of all waste shipment records and resulting correspondence. An asbestos waste shipment record appears at the end of this specification.

1.5 TITLE TO MATERIALS

Materials resulting from demolition work, except as specified otherwise, will become the responsibility of the contractor and will be disposed of as specified herein.

1.6 PROTECTION OF EXISTING WORK TO REMAIN

Perform demolition work without damage or contamination of adjacent work. Where such work is damaged or contaminated, restore work to the original condition at no additional cost to the government.

1.7 SEQUENCE OF WORK

No other work shall be performed in the asbestos regulated area prior to completion and certification of the asbestos abatement work.

1.8 PERMISSIBLE EXPOSURE LIMITS (PELS)

a. Time-weighted average limit (TWA). Ensure that no employee is exposed to an airborne concentration of asbestos in excess of

0.1 fiber per cubic centimeter of air as an eight (8) hour time-weighted average (TWA).

b. Excursion limit. Ensure that no employee is exposed to an airborne concentration of asbestos in excess of 1.0 fiber per cubic centimeter of air (1.0 f/cc) as averaged over a sampling period of thirty (30) minutes.

1.9 MEDICAL SURVEILLANCE 29 CFR 1926.1101(m)

1.9.1 Medical examinations

Submit evidence of a medical surveillance program for all employees who for a combined total of 30 or more days per year are engaged in Class I, II and III work or are exposed at or above the permissible exposure limit or excursion limit, and for employees who wear negative pressure respirators. The content of the examination shall be consistent with 29 CFR 1926.1101 (m). This examination is not required if adequate records show the employee has been examined as required by 29 CFR 1926.1101 (m) within the past year. The same medical examination shall be given on an annual basis to employees engaged in an occupation involving asbestos fibers and within 30 calendar days before or after the termination of employment in such occupation.

1.9.2 Medical Records

Maintain complete and accurate records as required by 29 CFR 1926.1101(n) employees' medical examinations for a period of at least 40 years after termination of employment and make records of the required medical examinations available for inspection and copying to: The Assistant Secretary of Labor for Occupational Safety and Health, The Director of the National Institute for Occupational Safety and Health (NIOSH), authorized representatives of either, and an employee's physician upon the request of the employee or former employee.

1.10 TRAINING

All workers must receive training specific to the tasks performed on the project. In addition, each employee must have received an equivalent level of training within 3 months prior to assignment to asbestos work or shall be instructed for a minimum of 8 hours by the CIH with regard to the methods of recognizing asbestos; the health effects associated with asbestos; the relationship between smoking and asbestos in producing lung cancer; its purposes, proper use, fitting

instructions, and limitations of respirators; the nature of operations that could result in exposure to asbestos, the importance of necessary protective controls to minimize exposure and any necessary instructions in the use of these controls and procedures; the appropriate work practices for performing the asbestos removal job; medical surveillance program requirements; and a review of 29 CFR 1926.1101 safety and health precautions and the use and requirements for protective clothing and equipment including respirators. Fully cover engineering and other hazard control techniques and procedures. Maintain complete and accurate records of training for each employee. Records shall be maintained for one year beyond the last date of employment.

Employees who perform Class I or Class II removals will have received the EPA worker 4-day course. Supervisors will have received the EPA 5-day Competent person training.

1.12 PERMITS

Obtain necessary permits in conjunction with this project for the abatement, demolition, transportation and disposal of asbestos containing materials, and provide timely notification of such actions as may be required by Federal, State, regional, and local authorities. Refer, also, to SD-18, Records (Landfill Delivery Records) for additional requirements.

1.13 SAFETY AND HEALTH COMPLIANCE

In addition to detailed requirements of this specifications, comply with laws, ordinances, rules, and regulations of Federal, State, regional, and local authorities regarding handling, storing, transporting, and disposing of asbestos waste materials. Comply with the applicable requirements of the current issue of 29 CFR 1926.1101 and 40 CFR 61, Subpart A and 40 CFR 61, Subpart M. Submit matters of interpretation of standards to the appropriate administrative agency for resolution before starting work. Where specification requirements and referenced documents vary, the most stringent requirements will apply.

PART 2 PRODUCTS

2.1 EQUIPMENT AND MATERIAL USED IN REMOVAL OPERATIONS

Furnish the contracting officer with two complete sets of personal protective equipment, as required herein, for each entry into and inspection of the regulated area.

2.2 RESPIRATORS

The contractor will provide respirators , and ensure they are used in the following circumstances. Respiratory protection is required on all asbestos abatement jobs.

- a. During all class I removal jobs.
- b. During all class II work where the ACM is not removed in a substantially intact state.
- c. During all Class II and III work which is not performed using wet methods, provided, however that respirators need not be worn during removal of sloped roofs when a negative exposure assessment has been made and the ACM is removed in an intact state.
- d. During all Class II and III asbestos jobs where the contractor does not produce a "negative exposure assessment."
- e. During all Class III jobs where TSI or surfacing ACM or PACM is to be disturbed.
- f. During all Class IV work performed in regulated areas where employees performing other work are required to wear respirators.
- g. During all work where employees are exposed above the PEL or the excursion limit.
- h. During emergencies.

Select respirators approved by the Mine Safety and Health Administration (MSHA) and the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services, for use in atmospheres containing asbestos fibers according to the table below. During the performance of work when removal or demolition of asbestos materials is not underway and after the TWA and ceiling limits have been established, the contractor shall provide respirators as required in 29 CFR 1926.1101(h). The contractor shall establish a respirator program as required by ANSI Z88.2-80 and 29 CFR 1910.134.

RESPIRATORY PROTECTION FOR ASBESTOS FIBERS

<u>Airborne concentration of asbestos or condition of use</u>	<u>Required respirator</u>
Not in excess of 1 f/cc (10XPEL), or purifying respirator otherwise as required independent other than a disposable, equipped of exposure filters.	Half-mask air with high efficiency
Not in excess of 5 f/cc (50XPEL). air-purifying with high	Fullface piece respirator equipped efficiency filters.
Not in excess of 10 f/cc (100XPEL). air-purifying with high any supplied operated in	Any powered respirator equipped efficiency filters or air respirator continuous flow mode.
Not in excess of 100 f/cc (100XPEL) supplied - air in	Fullface piece respirator operated pressure demand mode.
Greater than 100 f/cc supplied air (1,000XPEL), or unknown concentration. in equipped with pressure self apparatus.	Fullface piece respirator operated pressure demand mode, an auxiliary positive contained breathing

*Airborne concentrations are based upon the 8 hour TWA - PEL

*A high efficiency filter means a filter that is at least 99.97 percent efficient against mono-dispersed particles of 0.3 micrometers in diameter or larger.

*Air purifying respirators must be equipped with high-efficiency particulate air (HEPA) filters. The HEPA filters are not reusable.

In addition to the above selection criteria the contractor will provide tight fitting powered air purifying respirators equipped with high efficiency filters or a full face piece supplied air respirator operated in the pressure demand mode equipped with HEPA egress cartridges or an auxiliary positive pressure self contained breathing apparatus for all employees within the regulated area where Class I work is being performed for which a negative exposure assessment has not been produced and the exposure assessment indicates the level will not exceed 1 f/cc as an 8- hour time weighted average. A full face piece supplied air respirator operated in the pressure demand mode equipped with an auxiliary positive pressure self-contained breathing apparatus shall be provided under such conditions, if the exposure assessment indicates exposure levels above 1.0 f/cc as an 8-hour time weighted average.

2.3 SPECIAL CLOTHING

2.3.1 Protective Clothing

Protective clothing shall be coveralls or similar whole-body clothing, head coverings, gloves, and foot coverings.

2.3.2 Work Clothing

Provide boot covers and cloth work clothes to be worn under the protective coveralls.

2.4 HYGIENE FACILITIES

A decontamination area shall consist of an equipment room, shower area, and clean room in series. The equipment room shall be supplied with impermeable, labeled bags and containers for the containment and disposal of contaminated protective equipment. Shower facilities shall be provided which comply with 29 CFR 1910.14(d)(3). The clean change room shall be equipped with a locker or appropriate storage container for each employee's use.

2.5 EYE PROTECTION

Provide goggles for personnel engaged in asbestos operations when the use of a full face respirator is not required. Eye protection will be provided as per 29 CFR 1910.133 OSHA's Eye and Face Protection Standard.

2.6 WARNING SIGNS AND LABELS

2.6.1 Warning Signs

Warning signs must be of sufficient size to be clearly legible and display the following information:

DANGER

ASBESTOS

CANCER AND LUNG DISEASE HAZARD

AUTHORIZED PERSONNEL ONLY

RESPIRATORS AND PROTECTIVE CLOTHING ARE REQUIRED IN THIS AREA

2.6.2 Warning Labels

Labels must be of sufficient size to be clearly legible, printed in large, bold letters on a contrasting background, and displaying the following legend:

DANGER

CONTAINS ASBESTOS FIBERS

AVOID CREATING DUST

CANCER AND LUNG DISEASE HAZARD

2.7 LOCAL EXHAUST SYSTEM

Provide a local exhaust system in the enclosed regulated areas. Filters on vacuums and exhaust equipment will be UL 586-labeled HEPA filters. Local exhaust equipment shall be sufficient to maintain a minimum pressure differential of minus 0.02 inches of water column relative to adjacent, unsealed areas. The local exhaust system must be equipped with a manometer-type negative pressure differential monitor with minor scale division of 0.02 inches of water and accuracy within plus or minus 10 percent. The manometer must be calibrated daily as recommended by the manufacturer. Provide manually recorded manometer readings of the pressure differential between the enclosed regulated area and adjacent unsealed areas at the beginning of each workday and every 2 working hours thereafter. The local exhaust system will be operated continuously, 24 hours per day, until the regulated area enclosure is removed. Replace filters as required to maintain the efficiency of the system. The building heating, ventilating, and air-conditioning (HVAC) system will not be used as the local exhaust system for the enclosed regulated area.

2.8 TOOLS AND MISCELLANEOUS EQUIPMENT

2.8.1 Airless Sprayer

An airless sprayer, suitable for application of sealing material, will be used.

2.8.2 Scaffolding

Scaffolding, as required to accomplish the specified work, shall meet all applicable safety regulations.

2.8.3 Transportation Equipment

Transportation equipment, as required, will be suitable for loading, temporary storage, transporting, and unloading of contaminated waste without exposure to persons or property.

2.8.4 Vacuum Equipment

All vacuum equipment utilized in the work area will utilize HEPA filtration systems.

2.8.5 Water Sprayer

The water sprayer will be an airless or other low pressure sprayer for amended water application.

2.8.6 Other Tools and Equipment

The contractor shall provide other suitable tools for the stripping, removal, encapsulation and disposal activities including but not limited to: knives, stiff nylon brushes, sponges, rounded edge shovels, brooms, and carts.

2.9 MATERIALS

2.9.1 Lockdown Sealant

The sealing agent will be penetrating sealants and will meet the following criteria:

a. They will withstand most impact or abrasion and protect the surface.

b. Sealants selected for use by the contractor will be one of those demonstrating probable effective performance under the tests conducted by an independent testing laboratory and are approved by the contracting officer.

c. They will have high flame retardant characteristics, and a low toxic fume and smoke emission rating.

d. They will not be noxious or toxic to application workers, or subsequent workers in the area.

e. They will have some permeability to water vapor to prevent condensation accumulation, and resist solution by common cleaning agents. They will be water insoluble when cured.

f. They will be acceptable weathering and aging characteristics.

g. They will be acceptable by architectural standards.

h. They will be compatible with all insulating material likely to be applied to the stripped surfaces.

I. They will be demonstrably capable of adhering to the surfaces of the substrate.

j. They must contain a light blue or red paint tint.
(Food coloring is not acceptable.)

PART 3 EXECUTION

3.1 GENERAL

3.1.1 Respirator Program.

Submit evidence of a respirator program as required by ANSI Z88.2 and 29 CFR 1910.134.

3.1.2 Protective Clothing

Provide and require the use of protective clothing for any employee exposed to airborne concentrations of asbestos that exceed the TWA and/or excursion limit, or for which a required negative exposure assessment is not produced, and for any employee performing Class I and II operations (other than roofing felts and mastics) which involve the removal of over 25 linear or 10 square feet of TSI or surfacing ACM and PACM.

3.1.3 Hygiene Facilities

For employees performing Class I work involving over 25 linear or 10 square feet of TSI or surfacing ACM and PACM, establish a decontamination area that consists of an equipment room, shower area, and clean room in series. Ensure that employees enter and exit the regulated area through the decontamination area. Where it is demonstrated that it is not feasible to locate the shower between the equipment room and the clean room, or where work is performed outdoors, ensure that employees remove asbestos contamination from their work suits in the equipment room using a HEPA vacuum before proceeding to a shower.

3.1.4 Warning Signs and Labels

Provide warning signs at approaches to regulated areas containing airborne asbestos fibers. Locate signs at such a distance that personnel may read the sign and take the necessary protective steps required before entering the area. Provide labels and affix to asbestos materials, scrap, waste, debris, and other products contaminated with asbestos.

3.1.5 Accessibility of Work Areas

The Government will rearrange areas to the extent of providing a reasonable, direct, and an unobstructed path to the work sites. During asbestos removal, the Contractor will confine his equipment and employee pattern to these designated areas. Where the building is still occupied during the removal operations, interference with the functional operation of the building occupants outside these areas will not be permitted. Where conflicts arise due to Contractor's operations, the decision of the Contracting officer or his authorized representative will be final.

3.1.6 Preparation for Removal

3.1.6.1 Movable Furnishings

Movable furnishings, equipment and fixtures in the work area will be pre-cleaned and removed from the area of work by the Government before asbestos work begins.

3.1.6.2 Pre-Cleaning

All wall and floor surface areas, other than those from which asbestos is to be removed, and all non-movable furnishings, equipment, and fixtures remaining in the work area will be pre-cleaned with a HEPA filter equipped vacuuming device or wet cleaning methods prior to sealing with plastic sheeting. Do not use any methods which would raise dust such as dry sweeping or vacuuming with equipment not equipped with HEPA filters. After pre-cleaning, enclose fixed objects in 6-mil polyethylene sheeting, label, and seal securely with tape, objects which must remain in the work area and that require special ventilation or enclosure requirements will be suitably protected as approved by the contracting officer. Items in the work area which may require access by user during abatement will be designated during the pre-abatement walkthrough and enclosures constructed with access flaps sealed with waterproof tape.

3.1.7 Regulated Areas

All Class I, II, and III asbestos work will be conducted within regulated areas. The regulated area will be demarcated in any manner that minimizes the number of persons within the area and protects persons outside the area from exposure to airborne

concentrations of asbestos. Where critical barriers or negative pressure enclosures are used, demarcate the regulated area. Signs will be provided and displayed pursuant to 29 CFR 1926.1101(k)(6). Access to regulated areas will be limited to authorized persons. All persons entering a regulated area where employees are required to wear respirators, will be supplied with a respirator. All asbestos work performed within regulated areas will be supervised by a competent person.

3.1.7.1 Enclosed (Critical Barrier) Regulated Area Requirements

Seal openings in areas where the release of airborne asbestos fibers is expected. Establish a regulated area with the use of curtains, portable partitions, or other enclosures in order to prevent the escape of asbestos fibers from the contaminated area. The established regulated area will be provided with protective covering of walls and ceilings with a continuous membrane of two layers of minimum 6-mil plastic sheeting sealed with tape to prevent water or other damage and two layers of 6-mil plastic sheeting over floors extending a minimum of 24 inches up walls. All penetrations of the floor, walls, and ceiling will be sealed with 6-mil polyethylene plastic and duct tape. Seal joints using spray adhesive and duct tape. Openings will be allowed in enclosures of regulated areas for the supply and exhaust of air for the local exhaust system.

3.2 ASBESTOS ABATEMENT PROCEDURES

3.2.1 Initial Exposure Assessment

Ensure that a "competent person" conducts an exposure assessment immediately before or at the initiation of the operation to ascertain expected exposure during that operation or workplace. The assessment must be completed in time to comply with requirements which are triggered by exposure data or the lack of a "negative exposure assessment," and to provide information necessary to assure that all control systems planned are appropriate for that operation will work properly.

An Initial Exposure Assessment will be conducted in accordance with 29 CFR 1926.1101

For Class I asbestos work, until exposure monitoring is conducted, and it is documented that employees on the job will not be exposed in excess of the PELs, or otherwise makes a negative exposure assessment, it is presumed that employees are exposed

in excess of the TWA and excursion limit. A negative exposure assessment can only be obtained by demonstrating requirements contained in 29 CFR 1926.1101.

3.2.2 Monitoring Requirements

Perform exposure monitoring as required to determine accurately the airborne concentrations of asbestos to which employees are exposed. Determinations of employee exposure will be made from breathing zone air samples that are representative of the 8-hour TWA and 30-minute short-term exposures of each employee. Representative 8-hour TWA employee exposure will be determined on the basis of one or more samples representing full-shift exposure for employees in each work area. Representative 30-minute short-term employee exposures will be determined on the basis of one or more samples representing 30-minute exposures associated with operations that are most likely to produce exposures above the excursion limit for employees in each work area.

3.2.2.1 Monitoring Prior to Asbestos Work

Provide area monitoring and establish the reference TWA 1 day prior to the masking and sealing operations for each asbestos removal site. The reference TWA is determined by taking at least three general area air samples in each asbestos regulated area.

3.2.2.2 Periodic monitoring

Conduct daily monitoring that is representative of the exposure of each employee who is assigned to work within a regulated area who is performing Class I or II work unless a negative exposure assessment for the entire operation has been made. Conduct periodic monitoring of all work where exposures are expected to exceed a PEL at intervals sufficient to document the validity of the exposure prediction. When all employees required to be monitored daily are equipped with supplied-air respirators operated in the positive-pressure mode, daily monitoring is not required. However employees performing Class I work using a control method which is not listed in Class I Requirements paragraph, will continue to be monitored daily even if they are equipped with supplied-air respirators.

3.2.2.3 Monitoring Adjacent Areas Prior to Asbestos Work

Provide area monitoring and establish the reference TWA inside the building outside the enclosed regulated area 1 day prior to beginning asbestos work.

3.2.2.4 Termination of Monitoring

If the periodic monitoring reveals that employee exposures, as indicated by statistically reliable measurement, are below the PEL and excursion limit, monitoring may be discontinued for those employees whose exposures are represented by such monitoring. Institute additional monitoring whenever there has been a change in process, control equipment, personnel or work practices that may result in new or additional exposures above the PEL and/or excursion limit.

3.2.3 Respiratory Protection

Respirators will be provided and used according to the requirements of 29 CFR 1926.1101 and section 2.2 of this specification.

3.2.4 Controls and Work Practices

The following controls and work practices will be used in all classes of work regardless of levels of exposure:

- a. Vacuum cleaners equipped with HEPA filters to collect all debris and dust containing ACM or PACM;
- b. Wet methods, or wetting agents, to control employee exposures during asbestos handling, mixing, removal, cutting, application, and cleanup, except where demonstrated that the use of wet methods are infeasible;
- c. Prompt clean-up and disposal of wastes and debris contaminated with asbestos in leak-tight container;
- d. Local exhaust ventilation equipped with HEPA filter dust collection systems;
- e. Enclosure or isolation of processes producing asbestos dust;
- f. Ventilation of the regulated area to move contaminated air away from the breathing zone and toward a filtration or a collection device equipped with a HEPA filter.

The following work practices and controls will not be used for work related to asbestos or the work which disturbs ACM or PACM, regardless of measured levels of asbestos exposure or results of the initial exposure assessments:

- a. High-speed abrasive disc saws that are not equipped with point of cut ventilator or enclosures with HEPA filters exhaust air;
- b. Compressed air used to remove asbestos, or ACM, unless the compressed air is used in conjunction with an enclosed ventilation system designed to capture the dust cloud created by the compressed air;
- c. Dry sweeping, shoveling or other dry clean-up and debris containing ACM and PACM;
- d. Employee rotation as a means of reducing employee exposure to asbestos.

3.2.5 Class I Abatement Requirements

In addition to all provisions required in control and work methods above, the following controls and work practices will be used for all Class I work.

- a. Installation and operation of the control systems, will be supervised by a competent person.
- b. Work involving the removal of more than 25 linear or 10 square feet of thermal system insulation or surfacing material; for all other Class I jobs, where a negative exposure assessment, or where employees are working in areas adjacent to the regulated area, while the Class I work is being performed, use one of the following methods to ensure that airborne asbestos does not migrate from the regulated areas:

- (1) Critical barriers will be placed over all openings to the regulated area;

- (2) Use another barrier or isolation method which prevents the migration of airborne asbestos from the regulated area, as verified by perimeter area surveillance during each work shift at each boundary of the regulated area, showing no visible asbestos dust; and perimeter area monitoring showing

that clearance levels contained in 40 CFR Part 763, Subpart 3, or that perimeter area levels are no more than background levels representing the same area before the asbestos work began.

c. HVAC systems will be isolated in the regulated area by sealing with a double layer of 6 mil plastic or the equivalent;

d. Impermeable dropcloths will be placed on surfaces beneath all removal activity;

e. All objects within the regulated area will be cleaned out and covered with impermeable dropcloths or plastic sheeting which is secured by duct tape or an equivalent.

f. Where a negative exposure assessment cannot be produced, or where exposure monitoring shows that a PEL is exceeded, ventilate the regulated area to move contaminated air away from the breathing zone of employees toward a HEPA filtration or collection device.

3.2.5.1.1 Vinyl and Asphalt Flooring Materials

For removing vinyl and asphalt flooring materials which contain ACM in buildings constructed no later than 1980:

a. Flooring or its backing will not be sanded.

b. Vacuums equipped with HEPA filter, disposable dust bag, and metal floor tool (no brush) will be used to clean floors.

c. Resilient sheeting will be removed by cutting with wetting of the snippoint and wetting during delamination. Rip-up of resilient sheet floor material is prohibited.

d. All scraping of residual adhesive and/or backing will be performed using wet methods.

e. Dry sweeping is prohibited.

f. Mechanical chipping is prohibited unless performed in a negative pressure enclosure which meets the requirement of this section.

g. Tiles will be removed intact, unless it is demonstrated that intact removal is not possible.

h. When tiles are heated and can be removed intact, wetting may be omitted.

I. Resilient flooring material including associated mastic and backing will be assumed to be asbestos-containing materials unless an industrial hygienist determines them to be non asbestos containing materials using recognized analytical techniques.

J. Splash guards consisting of 6 mil polyethylene sheeting will be utilized when chemical strippers are used . Splash guards will extend along the wall from the floor to a height of 4 feet.

3.2.5.1.2 Any other Removal of ACM

a. The material will be thoroughly wetted with amended water prior and during its removal.

b. The material will be removed in an intact state unless the employer demonstrates that intact removal is not possible.

c. Cutting, abrading, or breaking the material will be prohibited unless the employer can demonstrate that methods less likely to result in asbestos fiber release are not feasible.

d. ACM removed will be immediately bagged or wrapped, or kept wetted until transferred to a closed receptacle, no later than the end of the work shift.

3.2.5.3 Asbestos Contaminated Soil

Any area of contaminated soil is to be removed of by the following procedures:

a. Before the soil removal commences, mark the wall in the area(s) at the existing ground elevation.

b. Using small shovels, all loose soil will be removed to a minimum depth of 3 inches.

c. Verification of the depth will be made by measurement from the excavation floor to the bottom of the original ground elevation mark or the wall.

3.3 COLLECTION

3.3.1 Nonfriable Non-Regulated Asbestos Containing Material (Non-RACM)

The non-friable ACM found in this project will be handled as RACM and will require special collection action as detailed in Para. 3.3.2.

The notification requirements of Para. 1.4.2 also are applicable to Non-RACM.

3.3.2 Regulated Asbestos Containing Material (RACM)

All asbestos containing materials for this project will be treated as RACM due to the nature of the materials present. Asbestos containing material will be removed in manageable sections and maintained in a wet condition. Material should be containerized upon removal and before being moved to any new location.

Maintain surfaces of the regulated area free of accumulations of asbestos fibers. Restrict the spread of dust and debris; keep waste from being distributed over the general area. Do not dry sweep or blow down the space with compressed air.

Collect asbestos waste, scrap, debris, bags, containers, equipment, and asbestos-contaminated clothing which may produce airborne concentrations of asbestos fibers; place in sealed impermeable bags imprinted with a caution label (Para. 2.6.2) and label with the name of the contractor and the location at which the waste was generated. The sealed bags will then be placed in a second sealed impermeable bag also imprinted with the warning label. Bags will be placed in asbestos roll off boxes for shipment to the landfill.

3.3.2.1 Removing Material Intact

Asbestos containing materials should be removed intact whenever possible (removal of pipe and pipe insulation by wrapping, sealing the insulation and cutting the uninsulated ends of the pipe). Asbestos containing materials will not be dropped or thrown to the ground. Materials between 15 and 50 feet above the ground may be containerized at elevated levels or placed into inclined chutes or scaffolding for subsequent collection

and containerization. Asbestos materials in open containers will be kept wet at all times.

3.3.2.2 Containers

Containers (drums or 6-mil polyethylene bags) will be sealed when full. Wet material will be heavy and double bagging of waste material is required. Bags, if used, will not be overfilled. They should be securely sealed to prevent accidental opening and leakage by tying the tops of the bags in an overhand knot or by taping in goose neck fashion. Do not seal bags with wire or cord. Bags may be placed in drums for staging and transportation to the landfill. Bags will be decontaminated on exterior surfaces by wet cleaning before being placed in clean drums and sealed with locking ring tops. Where unusual circumstances prohibit use of plastic disposal bags or drums, the contractor will submit, in the asbestos plan, an alternate proposal for removal, containerizing, and disposal of the asbestos containing materials.

3.3.2.3 Sharp Edged Components

Asbestos containing or contaminated waste with sharp edged components (e.g. nails, screws, metal lath, tin sheeting) that could otherwise tear polyethylene bags will be placed into drums for disposal.

3.3.2.4 Asbestos Contaminated Soil

Any removed soil will be placed in 6-mil plastic bags, sealed and then placed in approved containers such as fiber waste drums for disposal. Do not overfill plastic bags.

3.3.2.5 Wastewater

a. Pre-filtering. Any water produced by the decontamination of either equipment or persons will be (1) collected, (2) filtered through a system capable of trapping particles 5 microns and larger, specifically designed to remove asbestos fibers, and (3) filtrate disposed into a local sanitary sewer system.

b. Filter System. The filtration system will contain a series of several filters with progressively smaller pore sizes to avoid rapid clogging of the system by large particles. Disposable filters will be treated as asbestos waste.

3.4 DISPOSAL OF ACM

3.4.1 All Asbestos Containing Materials

3.4.1.1. Prior to delivery of asbestos containing materials at the Woodlawn Landfill the contractor will provide Fort Campbell, PWBC Roads and Grounds at least 24 hours notice of when ACM is to be disposed.

3.4.2. Once drums, bags and otherwise containerized asbestos containing materials have been removed from the work area, they will be loaded into an enclosed truck for transportation to the Woodlawn landfill. Asbestos waste will not be allowed to be placed in trucks with non-asbestos waste. All bags utilized will be of 6-mil polyethylene and must be double lined.

3.4.3. All containers will be labelled according to the requirements of 29 CFR 1910.1200 OSHA Hazardous Communication Standard and will contain the following:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD

3.4.4. The enclosed cargo area of the truck will be free of debris and lined with 6-mil polyethylene sheeting to prevent contamination from leaking or spilled containers. Floor sheeting will be installed first and extend up the sidewalls. Wall sheeting will be overlapped and taped into place so that no materials may escape to the environment.

3.4.5. Drums will be placed on level surfaces in the cargo area and packed tightly together to prevent shifting and tipping. Do not throw containers into the cargo area.

3.4.6. Personnel loading asbestos containing waste will be protected by disposable clothing including head, body and foot protection and at a minimum, half-face piece, air purifying, dual cartridge respirators equipped with high efficiency particulate air (HEPA) filters.

3.4.7. Large steel dumpsters (roll-off boxes) may be used for asbestos waste disposal. These should be lined with polyethylene and should have doors, tops or covers that can be

closed to prevent vandalism or other disturbance of the containerized asbestos debris and wind dispersion of asbestos fibers. Uncontainerized asbestos materials will not be placed in these type dumpsters, nor will they be used for non-asbestos waste. Bags will be placed, not thrown, into these containers to avoid splitting.

3.4.8. Disposal of waste asbestos material at Woodlawn Landfill. Contact Fort Campbell-DPW, Environmental Division through the Contracting Officers representative.

3.4.9. For temporary storage, store sealed impermeable bags in asbestos waste drums. If temporary storage is within regulated areas and under negative pressure drums are not required. An area for interim storage of asbestos waste-containing drums will be assigned by the contracting officer or by an authorized representative. This area must be secure. No ACM wastes, except those properly labeled and properly containerized and physically located in the assigned holding area will be allowed to remain at the site overnight.

3.4.10. Procedures for hauling and disposing will comply with 40 CFR 61 Subpart M, 40 CFR 241, 40 CFR 257, and State, regional and local standards. Vehicles used to transport asbestos containing waste material must be clearly marked. The markings must:

(i) Be displayed in such a manner and location that a person can easily read the legend.

(ii) Conform to the requirements for 51 cm x 36 cm (20 in. x 14 in.) upright format signs specified in 29 CFR 1910.145(d)(4) and this paragraph; and

(iii) Display the following legend in the lower panel with letter sizes and styles of a visibility at least equal to those specified in this paragraph.

Legend

DANGER
ASBESTOS DUST HAZARD
CANCER AND LUNG DISEASE HAZARD
Authorized Personnel only

Notation

2.5 cm (1 inch) Sans Serif, Gothic or Block
2.5 cm (1 inch) Sans Serif, Gothic or Block
1.9 cm (3/4 inch) Sans Serif, Gothic or Block
14 Point Gothic

Spacing between any two lines must be at least equal to the height of the upper of the two lines.

3.4.11. Upon reaching the landfill, trucks are to approach the dump location as closely as possible for unloading of the asbestos containing waste.

3.4.12. Bags, drums and components will be inspected as they are off loaded at the disposal site. Material in damaged containers will be repacked in empty drums or bags as necessary. Uncontaminated drums may be recycled.

3.4.13. Waste containers will be placed on the ground at the disposal site, not pushed or thrown out of trucks since the weight of wet material could rupture containers.

3.4.14. Personnel off-loading containers at the disposal site will wear protective equipment consisting of disposable head, body and foot protection and, at a minimum, half-face piece, air-purifying, dual cartridge respirators equipped with high efficiency particulate air (HEPA) filters. Following the removal of all containerized waste, the truck cargo area will be decontaminated to meet the no visible residue criteria. Polyethylene sheeting will be removed and discarded along with contaminated cleaning materials and protective clothing, in bags or drums at the disposal site. If landfill personnel have not been provided with personal protective equipment for the compaction operation by the landfill operator, the contractor will supply protective clothing and respiratory protection for the duration of this operation.

3.4.15. Shipment Records

a. Maintain waste shipment records, using copies of the [form located at the end of this section](#) and include the following information:

(i) The name, address, and telephone number of the waste generator.

(ii) The name and address of the local, State, or EPA Regional office responsible for administering the asbestos NESHAP program.

(iii) The approximate quantity in cubic meters (cubic feet).

(iv) The name and telephone number of the disposal site operator.

(v) The name and physical site location of the disposal site.

(vi) The date transported.

(vii) The name, address, and telephone number of the transporter(s).

(viii) A certification that the contents of this consignment are fully and accurately described by proper shipping name and are classified, packed, marked, labeled, and are in all respects in proper condition for transport by highway according to applicable international and government regulations.

b. Provide a copy of the waste shipment record, described above to the disposal site owners or operators at the same time as the asbestos-containing waste material is delivered to the disposal site.

c. For waste shipments where a copy of the waste shipment record, signed by the owner or operator of the designated disposal site, is not received by the contractor within 35 days of the date the waste was transported, contact the owner or operator of the designated disposal site to determine the status of the waste shipment. The contractor will report in writing to the NESHAP administering agency if a copy of the waste shipment record, signed by the owner or operator of the designated waste disposal site, is not received by the contractor within 45 days of the date the waste was transported. Include in the report the following information:

(i) A copy of the waste shipment record for which a confirmation of delivery was not received, and

(ii) A cover letter explaining the efforts taken to locate the asbestos waste shipment and the results of those efforts.

d. Retain a copy of all waste shipment records, including a copy of the waste shipment record signed by the owner or operator of the designated waste disposal site, for at least 2 years.

e. Provide to the contracting officer within 3 working days following delivery of asbestos containing waste material copies of all waste shipment records. Also within 3 working days of initiation, provide to the contracting officer copies of any correspondence with the NESHAP administering agency.

Furnish upon request, and make available for inspection by the NESHAP administering agency, all records under this section.

3.4.16 Wastewater

It is the contractor's responsibility to comply with any local wastewater systems' regulations or policy regarding the disposal of wastewater from asbestos abatement activities.

3.5 CLEANUP AND FINAL CLEARANCE

3.5.1 Cleanup

Clean all surfaces in the work area and other contaminated areas with water and/or HEPA vacuum equipment. After cleaning the work area, allow 24 hours for settlement of dust and wet clean or clean with HEPA vacuum equipment all surfaces in the work area. When asbestos removal, disposal, and cleanup are complete, the contractor will certify, in writing, that the area is free of any asbestos material or debris.

3.5.2 Visual Inspection After Cleanup

Prior to the performance of final air monitoring, the contractor and the contracting officer or his representative will perform a visual inspection for asbestos dust/residue. If residue is found, additional wipedown/vacuuming will be performed to the satisfaction of the contracting officer. If recleaning is required, monitor the airborne fiber concentration after recleaning.

3.5.3 Monitoring After Final Cleanup

After the removal site has passed the visual inspection, provide area monitoring of fibers (at least 5 samples per removal site) under aggressive conditions. Collect and analyze the samples to establish airborne asbestos fiber concentration within the area after final cleanup but before removal of the enclosure of the regulated area. The fiber counts from the samples will be less than 0.01 fibers (longer than 5 micrometers) per cubic centimeter of air or not be greater than the levels referenced as background before the work was initiated, whichever is less. Should any of the final sampling indicate a higher value, the contractor will take appropriate actions to reclean the area and will repeat the monitoring.

3.5.4 Sampling

Sampling under aggressive conditions will include the following procedures:

- a. Before starting the sampling pumps, direct the exhaust from forced air equipment (such as a 1 horsepower leaf blower) against all walls, ceiling, floors, ledges and other surfaces in the room. This should take at least 5 minutes per 1000 sq. ft. of floor.
- b. Place a 20-inch fan in the center of the room. (Use one fan per 10,000 cubic feet of room space.) Place the fan on low speed and point it toward the ceiling.
- c. Start the sampling pumps and sample for the required time.
- d. Turn off the pump and then the fan(s) when sampling is complete.

3.5.5 Air Clearance Failure

Should clearance sampling results fail to meet the final cleanup requirements, the contractor will take appropriate action at no additional cost to the Government, to reclean, resample, and analyze data until final cleanup requirements are met.

3.5.6 Site Inspection

While performing asbestos removal work, the contractor will be subject to onsite inspection by the contracting officer who may be assisted by safety or health personnel. If the work is in

violation of specification requirements, the contracting officer will issue a stop work order to be in effect immediately and until the violation is resolved. Standby time and expenses required to resolve the violation will be at the contractor's expense.

3.5.7 Sealing Permanent Exposed Surfaces (RACM)

After the asbestos material has been removed and HEPA vacuumed to the greatest extent possible, all permanent asbestos exposed interior surfaces will be coated with an approved lockdown sealant to permanently bind any remaining fibers in place. Sealant will be applied by airless sprayers and in accordance with the sealant manufacturers recommendations.

3.5.8 Sealant Tint

The sealant will have an adequate tint to easily distinguish between sections sealed and sections not sealed.

3.5.9 Reestablishment of the Work Area

Reestablishment of the work area will occur only after the completion of the following to the contracting officers satisfaction: performance of clean-up procedures and the successful achievement/ documentation of clearance air monitoring values.

3.5.10 Visual Inspection

The contractor and contracting officer will visually inspect the work area for any remaining visible residue. Evidence of asbestos materials will necessitate additional cleaning requirements.

3.5.11 Clearance of Work Area

Following satisfactory clearance of the work area, remaining barriers may be removed and disposed of as asbestos contaminated waste.

3.5.12 Remaining Building Demolition Procedures

Contractor may proceed with remaining building demolition procedures as described in SECTION 02050: DEMOLITION.

End of Section

[Return to Designer Instructions](#)

ASBESTOS WASTE SHIPMENT RECORD

Department of Environment
and Conservation
Division of Air Pollution Control



9th Floor, L & C Annex
401 Church Street
Nashville, TN 37243-1531
(615) 532-0554

ASBESTOS WASTE SHIPMENT RECORD

GENERATOR			
1. Work site name and mailing address	Owner's name	Owner's telephone no. ()	
2. Operator's name and address		Operator's telephone no. ()	
3. Waste disposal site (WDS) name, mailing address, physical site location and disposal facility permit number		WDS phone no. ()	
		Permit no.	
4. Name and address of responsible agency			
5. Description of materials	6. Containers No. Type	7. Total quantity m ³ yd ³	
8. Special handling instructions and additional information			
9. OPERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and government regulations.			
Print/type name & title		Signature	Month Day Year
TRANSPORTER			
10. Transporter 1 (acknowledgement of receipt of materials)			
Print/type name & title		Signature	Month Day Year
Address		() Telephone No.	
11. Transporter 2 (acknowledgement of receipt of materials)			
Print/type name & title		Signature	Month Day Year
Address		() Telephone No.	
DISPOSAL SITE			
12. Discrepancy indication space			
13. Waste disposal site Owner or operator: Certification of receipt of asbestos materials covered by this manifest except as noted in item 12.			
Print/type name & title		Signature	Month Day Year

INSTRUCTIONS

Waste Generator Section (Items 1-9)

1. Enter the name of the facility at which asbestos waste is generated and the address where the facility is located. In the appropriate spaces, also enter the name of the owner of the facility and the owner's phone number.
2. If a demolition or renovation, enter the name and address of the company and authorized agent responsible for performing the asbestos removal. In the appropriate spaces, also enter the phone number of the operator.
3. Enter the name, address, and physical site location of the waste disposal site (WDS) that will be receiving the asbestos materials. In the appropriate spaces, also enter the phone number of the WDS. Enter "on-site" if the waste will be disposed of on the generator's property.
4. Provide the name and address of the local, State, or EPA Regional office responsible for administering the asbestos NESHAP program.
5. Indicate the types of asbestos waste materials generated. If from a demolition or renovation, indicate the amount of asbestos that is
 - Friable asbestos material
 - Nonfriable asbestos material
6. Enter the number of containers used to transport the asbestos materials listed in item 5. Also enter one of the following container codes used in transporting each type of asbestos material (specify any other type of container used if not listed below):
 - DM - Metal drums, barrels
 - DP - Plastic drums, barrels
 - BA - 6 mil plastic bags or wrapping
7. Enter the quantities of each type of asbestos material removed in units of cubic meters (cubic yards).
8. Use this space to indicate special transportation, treatment, storage or disposal or Bill of Lading information. If an alternate waste disposal site is designated, note it here. Emergency response telephone numbers or similar information may be included here.
9. The authorized agent of the waste generator must read and then sign and date this certification. The date is the date of receipt by transporter.

NOTE: The waste generator must retain a copy of this form.

Transporter Section (Items 10 & 11)

10. & 11. Enter name, address, and telephone number of each transporter used. If applicable, Print or type the full name and title of person accepting responsibility and acknowledging receipt of materials as listed on this waste shipment record for transport. Enter date of receipt and signature.

NOTE: The transporter must retain a copy of this form.

Disposal Site Section (Items 12 & 13)

12. The authorized representative of the WDS must note in this space any discrepancy between waste described on this manifest and waste actually received as well as any improperly enclosed or contained waste. Any rejected materials should be listed and destination of those materials provided. A site that converts asbestos-containing waste material to nonasbestos material is considered a WDS.
13. The signature (by hand) of the authorized WDS agent indicates acceptance and agreement with statements on this manifest except as noted in item 12. The date is the date of signature and receipt of shipment.

NOTE: The WDS must retain a completed copy of this form. The WDS must also send a completed copy to the operator listed in item 2.

[Back to Shipment Records Paragraph 1.4.5.1](#)
[Back to Shipment Records Paragraph 15](#)

NOTIFICATION OF ASBESTOS DEMOLITION OR RENOVATION FORM



DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF AIR POLLUTION CONTROL

NOTIFICATION OF ASBESTOS DEMOLITION OR RENOVATION

Operator Project #	Postmark	Date Received	Notification #	
I. Type of Notification (O-Orig., R-Revised, C-Cancelled)				
II. Facility Information (Identify Owner, Removal Contractor, Operator)				
Owner Name:				
Address:		State:	Zip:	
City:	Telephone: ()			
Removal Contractor:				
Address:		State:	Zip:	
City:	Telephone: ()			
Other Operator (If Different From Owner):				
Address:		State:	Zip:	
City:	Telephone: ()			
III. Type of Operation (D-Demo., O-Ordered Demo., R-Renov., E-Emer. Renov.)				
IV. Is Asbestos Present? (Yes/No)				
V. Facility Description (Include Building Name, Number and Floor or Room Number)				
Building Name:				
Address:		State:	Zip:	
City:	Telephone: ()			
Site Location:		# of Floors:	Age in Years:	
Building Site Total Sq. Ft.:		Prior Use:		
VI. Procedure and Analytical Method Used to Detect the Presence of Asbestos Material				
VII. Approximate Amount of Asbestos in Work Area Including				
1. Regulated ACM to be Removed	RACM To Be Removed	Nonfriable Asbestos Material		Units of Measurement
2. Category I ACM Not Removed		Not To Be Removed	To Be Removed	
3. Category II ACM Not Removed		Cat I	Cat II	
Pipes				LnFT Ln m
Surface Area				SqFT Sq m
Vol. RACM Off Facility Components				CuFT Cu m
VIII. Scheduled Dates for Asbestos Removal		Start:	Complete:	
Scheduled Dates of Preparation		Start:	Complete:	
Days of Week: (circle) ALL Sun Mon Tue Wed Thu Fri Sat		Hours of Day:		
IX. Scheduled Dates for Demo./Renovation		Start:	Complete:	
X. Description of Planned Demolition or Renovation Work, Method(s) to be Used:				
XI. Description of Work Practices and Engineering Controls to be used to Prevent Emissions of Asbestos at the Demolition and Renovation Site:				

XII. Waste Transporter #1			
Name:			
Address:			
City:	State:	Zip:	
Contact Person:	Telephone: ()		
Waste Transporter #2			
Name:			
Address:			
City:	State:	Zip:	
Contact Person:	Telephone: ()		
XIII. Waste Disposal Site			
Name:			
Location:			
City:	State:	Zip:	
Telephone:			
XIV. If Demolition Ordered by a Government Agency, Please Identify Below:			
Name:		Title:	
Authority:			
Date of Order (mm/dd/yy):		Date Ordered to Begin (mm/dd/yy)	
XV. For Emergency Renovations			
Date and Hour of Emergency (mm/dd/yy):			
Description of the Sudden, Unexpected Event:			
Explanation of How the Event Caused Unsafe Conditions or Would Cause Equipment Damage or an Unreasonable Financial Burden:			
XVI. Description of Procedures to be Followed in the Event Asbestos is Found or Previously Nonfriable Asbestos Material Becomes Crumbled, Pulverized, or Reduced to Powder.			
XVII. I Certify That an Individual Trained in the Provisions of this Regulation (40 CFR Part 61, Subpart M) Will be On-Site During the Demolition or Renovation and Evidence That Required Training has Been Accomplished by This Person Will be Available for Inspection During Normal Business Hours. (REQUIRED AFTER NOVEMBER 20, 1991)			
(Signature of Owner/Operator)			(Date)
XVIII. I Certify That the Above Information is Correct.			
(Signature of Owner/Operator)			(Date)

Submit Completed Form by U.S. Postal Service / Commercial Delivery Service or Hand Deliver to:

Department of Environment and Conservation
Division of Air Pollution Control
9th Floor, L & C Annex
401 Church Street
Nashville, TN 37243-1531
(615) 532-0554

[Back to Notification Requirements Paragraph 1.4.2.5](#)

WOODLAWN LANDFILL ASBESTOS POLICY

MEMORANDUM OF UNDERSTANDING

WOODLAWN ROAD LANDFILL FORT CAMPBELL, KENTUCKY

ASBESTOS POLICY

Woodlawn Landfill is operated under a permit issued by the Division of Solid Waste Management, Department of Conservation, State of Tennessee and in accordance with Federal, State and Local Regulations. A special waste permit was issued by the State of Tennessee for the landfill to accept Asbestos Containing Waste, but only with certain stipulations.

Haulers bringing asbestos waste to the landfill must comply with the Federal, State and Local Regulations and with state permit requirements. The following is a list of some of those requirements:

1. Any vehicle hauling asbestos containing waste must be marked with signs in accordance with APC rule 1200-3-11-02(2)(k)4 providing warning that the vehicle contains asbestos. Improperly marked vehicles will not be accepted at the landfill.
2. Any vehicle hauling asbestos containing waste must be enclosed or in a covered 39-14-503 carrier as described in Tennessee Code Annotated. Vehicles not meeting this requirement will not be accepted at the landfill.
3. The vehicle driver and any passengers must have fit tested respirators to be present or within 100 meters during unloading operations at the landfill. Facial hair that would interfere with a proper air seal around the respirator is not allowed on personnel wearing respirators unless the respirator has been specifically approved for that purpose. Failure to comply with the requirement will bar that individual from future entry into the landfill. A copy of the fit test certificate will be presented to the landfill operator when requested.
4. Asbestos waste will be placed in the area designated by the landfill personnel. The materials will be carefully unloaded to prevent spillage or puncture of the containers. Improper handling of the asbestos waste will prohibit that person from future asbestos operations at the landfill.
5. Asbestos waste will be accepted at the landfill only after receiving a 24 hour notice. A time will be designated for receiving the asbestos waste. Shipments arriving at the landfill more than thirty minutes from that time may be refused entry.
6. The shipper must furnish a copy of the NESHAP 10 day notice and an asbestos waste manifest to the landfill personnel before being accepted. Improperly completed information will be grounds to reject the acceptance of the asbestos waste.

I have read and understand the above requirements. I understand that failure to observe that regulations and requirements will cause me not to be allowed to deliver and dispose of asbestos containing waste at the Woodlawn Road Landfill.

Signature: _____

Employer: _____

Date: _____

Approved respirator fit test date: _____

[Back to Shipment Records Paragraph 1.4.5.1](#)

[Back to Instructions to Designers](#)

CHAPTER 3

Division 02000

Technical Requirements and Instructions

SECTION 02090

Removal and Disposal of Lead Containing Materials

Ft. Campbell Requirements:

Removal and disposal of lead containing materials shall be conducted in accordance with Ft. Campbell specification section 02090, Removal and Disposal of Lead Containing Materials, which shall be included in all projects containing or possibly containing lead products.

Lead containing materials shall be removed before demolition of buildings.

Instruction to Designers:

1. All projects containing or possibly containing lead products shall include Ft. Campbell specification section [02090, Removal and Disposal of Lead Containing Materials](#).
2. Additional Environmental guidance applies. See [Appendix A](#).

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02090 Removal and Disposal of Lead Containing Materials

SECTION 02090

Removal and Disposal of Lead Containing Painted Materials

10/97

PART 1 GENERAL

1.1 Intent

The intention of this specification is to summarize the requirements of the contractor to protect his workers in accordance with the OSHA Lead Construction Standard detailed in 29 CFR 1926.62. This standard is intended to reduce the occupational health hazard of lead exposure and must be applied to all occupational exposures to lead in construction work in any amount. The intent of this specification is also to summarize requirements for segregation and disposal of lead containing waste resulting from the demolition.

The contractor is required by 29 CFR 1926.62 to perform an exposure assessment to determine if any employee may be exposed to lead at or above the action level of 30 ug/m³ as an 8-hour TWA. As per the standard the contractor must perform initial air monitoring or present objective data, demonstrating that under any conditions or activity involving lead at or above the action level does not exist. During initial air monitoring activities, or until a negative exposure assessment has been achieved all employees must wear the appropriate respiratory protection when performing certain listed high exposure •trigger tasks as defined by the standard.

This document only summarizes requirements of the OSHA standard for convenience purposes and is not all-inclusive. All requirements of 29 CFR 1926.62 are to be strictly followed along with all other applicable Federal, State and local regulations.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referenced within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z9.2 - 1979 Fundamentals Governing the Design and Operation of Local

Exhaust Systems

ANSI Z88.2 - 1980 Respiratory Protection

CODE OF FEDERAL REGULATIONS (CFR)

- 29 CFR 1910.134 - Respiratory Protection
- 29 CFR 1910.1025 - Lead Standard for General Industry
- 29 CFR 1910.1200 - Hazard Communication
- 29 CFR 1926.55 - Gases, Vapors, Fumes, Dusts, and Mists
- 29 CFR 1926.57 - Ventilation
- 29 CFR 1926.62 - Lead Standard for General Industry
- 40 CFR 260 - Hazardous Waste Management Systems: General
- 40 CFR 261 - Identification and Listing of Hazardous Waste
- 40 CFR 262 - Generators of Hazardous Waste
- 40 CFR 263 - Transporters of Hazardous Waste
- 40 CFR 264 - Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
- 40 CFR 265 - Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
- 40 CFR 268 - Land Disposal Restrictions
- 49 CFR 172 - Hazardous Materials Tables and Hazardous Materials Communications Regulations
- 49 CFR 178 - Shipping Container Specification

UNDERWRITERS LABORATORIES INC. (UL)

UL 586 - 1990 High-Efficiency, Particulate, Air Filter Units

1.3 DEFINITIONS

1.3.1 Action Level

Employee exposure, without regard to use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter ($\bullet\text{g}/\text{m}^3$) of air averaged over an 8-hour period. As used in this section, "30 micrograms per cubic meter of air" refers to the action level.

1.3.2 Area Monitoring

Sampling of lead concentrations within the lead control area and inside the physical boundaries which is representative of the airborne lead concentrations which may reach the breathing zone of personnel potentially exposed to lead.

1.3.3 Physical Boundary

Area physically roped or partitioned off around a lead control area to limit unauthorized entry of personnel. As used in this section, "inside boundary" will mean the same as "inside lead control area."

1.3.4 Certified Industrial Hygienist (CIH)

As used in this section, refers to an Industrial Hygienist employed by the Contractor and is certified by the American Board of Industrial Hygiene in comprehensive practice.

1.3.5 Change Rooms and Shower Facilities

Rooms within the designated physical boundary around the lead control area equipped with separate storage facilities for clean protective work clothing and equipment and for street clothes which prevent cross-contamination.

1.3.6 Decontamination Room

Room for removal of contaminated personal protective equipment (PPE).

1.3.7 Eight-Hour Time Weighted Average (TWA)

Airborne concentration of lead averaged over an 8-hour workday to which an employee is exposed.

1.3.8 High Efficiency Particulate Air (HEPA) Filter Equipment

HEPA filtered vacuuming equipment with a UL 586 filter system capable of collecting and retaining lead-contaminated paint dust. A high efficiency particulate filter means 99.97 percent efficient against 0.3 micron size particles.

1.3.9 Lead

Metallic lead, inorganic lead compounds, and organic lead soaps. Excluded from this definition are other organic lead compounds.

1.3.10 Lead Control Area

An area isolated by physical boundaries to prevent unauthorized entry of personnel. It may consist of an enclosed area or structure with full containment to prevent the spread of lead dust, paint chips, or debris of lead-containing paint removal/demolition operations or in those cases, when an enclosed lead control area is not practical, restriction of access into the area may be accomplished by roping off the area or by providing some other form of physical boundary constraint.

1.3.11 Lead Permissible Exposure Limit (PEL)

Fifty micrograms per cubic meter of air as an 8-hour time weighted average as determined by 29 CFR 1910.1025. If an employee is exposed for more than 8 hours in a work day, the PEL shall be determined by the following formula:

PEL (micrograms/cubic meter of air) = 400/No. hrs worked per day

1.3.12 Personal Monitoring

Sampling of lead concentrations within the breathing zone of an employee to determine the 8-hour time weighted average concentration in accordance with 29 CFR 1926.62. Samples shall be representative of the employee's work tasks. Breathing zone shall be considered an area within a hemisphere, forward of the shoulders, with a radius of 6 to 9 inches and the center at the nose or mouth of an employee.

1.4 QUALITY ASSURANCE

1.4.1 Medical Examinations

Before exposure to lead-contaminated dust, provide workers with a comprehensive medical examination as required by 29 CFR 1926.62 and 29 CFR 1910.1200. The examination will not be required if adequate records show that employees have been examined as required by 29 CFR 1926.62 within the last year.

1.4.1.1 Medical Records

Maintain complete and accurate medical records of employees for a period of at least 40 years or for the duration of employment plus 20 years, whichever is longer.

1.4.2 CIH or Their Designated Representative Responsibilities:

- a. Certify training.
- b. Review and approve lead-containing paint demolition plan for conformance to the applicable referenced standards.
- c. Inspect the demolition work for conformance with the approved plan.
- d. Direct monitoring.
- e. Ensure work is performed in strict accordance with specifications at all times.
- f. Ensure hazardous exposure to personnel and to the environment are adequately controlled at all times.

1.4.3 Training

Train each employee performing paint demolition, disposal, and air sampling operations prior to the time of initial job assignment, in accordance with 29 CFR 1926.62.

1.4.3.1 Training Certification

Submit certificates signed and dated by the CIH and by each employee stating that the employee has received training.

1.4.4 Respiratory Protection Program

- a. Furnish each employee required to wear a negative pressure respirator or other appropriate type with a respirator fit test at the time of initial fitting and at least every 6 months thereafter as required by 29 CFR 1926.62.
- b. Establish and implement a respiratory protection program as required by ANSI Z88.2, 29 CFR 1910.134, 29 CFR 1910.1025, CFR 1926.62, and 29 CFR 1926.55.

1.4.5 Hazard Communication Program

Establish and implement a Hazard Communication Program as required by 29 CFR 1910.1200.

1.4.6 NOT USED

1.4.7 Safety and Health Compliance

In addition to the detailed requirements of this specification, comply with laws, ordinances, rules, and regulations of federal, state, and local authorities regarding removing, handling, storing, transporting, and disposing of lead waste materials. Comply with the applicable requirements of the current issue of 29 CFR 1926.62.

1.4.8 Pre-Construction Conference

Along with the CIH, meet with the Contracting Officer to discuss in detail the lead-containing paint demolition work plan, including work procedures and precautions for the work plan.

1.5 SUBMITTALS

Submit the following in accordance with Section C-01300, "Submittals." The testing laboratory qualifications and lead-containing demolition plan shall be approved by the government. All other submittals will be for informational purposes only.

1.5.1 Manufacturer's Catalog Data

- a. Vacuum filters
- b. Respirators

1.5.2 NOT USED

1.5.3 Statements

- a. Qualifications of CIH
- b. Exposure assessment documentation
- c. Testing laboratory qualifications
- d. Lead-containing paint demolition plan
- e. Rental equipment notification
- f. CIH approval of work plan (signature, date, and certification number)

- g. Respiratory protection program
- h. Hazard communication program

1.5.3.1 CIH Qualifications

Submit name, address, and telephone number of the CIH selected to perform responsibilities in paragraph entitled "CIH Responsibilities." Provide previous experience of the CIH. Submit proper documentation that the Industrial Hygienist is certified by the American Board of Industrial Hygiene in comprehensive practice, including certification number and date of certification/recertification.

1.5.3.2 Testing Laboratory

The contractor will provide documentation which includes the name, address and telephone number of the laboratories to be providing services. In addition, the documentation will indicate that each laboratory is an EPA National Lead Laboratory accreditation Program (NLLAP) accredited laboratory that each is rated proficient in the NIOSH/ EPA Environmental Lead Proficiency Analytical Testing Program (ELPAT) and will document the date of current accreditation. Certification will include accreditation for heavy metal analyses, list of experience relevant to analyses of lead in air, and a Quality Assurance and Quality Control Program.

1.5.3.3 Written Compliance Plan

In accordance with 29 CFR 1926.62 (e)(2)(I), the contractor shall submit a detailed job-specific plan of the work procedures to be used in the demolition of the buildings. The written compliance plan should include but is not limited to:

- a. Details of the planned exposure assessment or a discussion of the objective data utilized from a previous project.

- b. A description of equipment and materials, controls, crew size, job responsibilities, and operations and maintenance procedures for each activity in which lead is emitted.

- c. A description of specific control methods (e.g., abatement process selection, wet methods). For engineering controls, include supporting engineering plans and studies used to select methods.

- d. Technology considered in meeting the PEL.

- e. Air monitoring data documenting sources of lead emissions.

f. A detailed implementation schedule for the compliance plan, including the schedule for inspections by a competent person.

g. A description of the lead work practice program that will be used to control worker exposures. (This includes the use of protective work clothing and equipment, hygiene facilities and practices, and housekeeping practices.

h. A description of arrangements made among contractors on multi-contractor work sites to inform affected employees (including bystanders) of potential lead exposures, and to clarify responsibilities with regard to control of those exposures.

1.5.4 Air Monitoring

Submit monitoring results to the Contracting Officer within 3 working days, signed by the testing laboratory employee performing the air monitoring, the employee that analyzed the sample, and the CIH.

1.5.5 NOT USED

1.5.6 SD-18, Records

- a. Certification of medical examinations
- b. Employee Training certification

1.6 REMOVAL

1.6.1 Title to Materials

Lead containing materials resulting from demolition work, except those classified as hazardous waste, will become the property of the Contractor and will be disposed in accordance with section 3.5 of this specification.

1.7 EQUIPMENT

The contractor shall furnish the Contracting Officer with one complete set of personal protective equipment daily, as required by the CIH, for entry into and inspection of the demolition work within the lead controlled area. Required personal protective equipment may include, but is not limited to fitted respirators and whole body covering including appropriate foot, head, and hand protection. PPE shall be provided by the contractor and will remain the property of the contractor.

1.7.1 Respirators

Respirators will comply with the requirements of 29 CFR 1910.134. Furnish appropriate respirators approved by the NIOSH, Department

of Health and Human Services, for use in atmospheres containing lead dust.

1.7.2 Special Protective Clothing

Special protective clothing will be worn as per the Lead Protection Plan (sec 1.5.3.3) and in accordance with OSHA 29 CFR 1910 .132. Reduction of levels of protective clothing can only be performed after approval from the CIH.

1.7.2.1 Furnished Clothing

Protective clothing shall be provided in a clean and dry condition at least weekly, and daily to employees whose exposure levels without regard to use of a respirator are over $200 \mu\text{g}/\text{m}^3$ of lead as an 8-hour TWA. The contractor shall provide for the cleaning, laundering, and disposal of protective clothing and equipment as needed.

1.7.2.2 Protective Clothing Handling

The contractor shall assure that contaminated protective clothing which is to be cleaned, laundered, or disposed of, is placed in a closed container in the change area which prevents dispersion of lead outside the container.

The container shall be labeled as follows:

"CAUTION: Clothing contaminated with lead. Do not remove dust by blowing or shaking. Dispose of lead contaminated wash water in accordance with applicable local, state, or federal regulations."

1.7.3 Rental Equipment Notification

If rental equipment is to be used during lead-containing paint handling, removal, or demolition, notify the rental agency in writing concerning the intended use of the equipment. Furnish a copy of the written notification to the Contracting Officer.

1.7.4 Vacuum Filters

UL 586 labeled HEPA filter must be used.

PART 2 NOT USED

PART 3 EXECUTION

3.1 PROTECTION

3.1.1 Notification

Notify the Contracting Officer 20 days prior to the start of any demolition work where elements with lead containing coatings or paint are present.

3.1.2 NOT USED

3.1.3 Protection of Existing Work to Remain

Perform demolition work without damage or contamination of adjacent areas. Where existing work is damaged or contaminated, restore work to its original condition or better.

3.1.4 Boundary Requirements

Establish a lead control area to prevent the spread of lead dust, paint chips, or debris of lead-containing paint and restrict access to the area. Provide physical boundaries around the lead control area by roping off the area or providing curtains, portable partitions or other enclosures to ensure that airborne concentrations of lead will not reach 30 micrograms per cubic meter of air outside of the lead control area.

3.1.5 NOT USED

3.1.6 NOT USED

3.1.7 Change Room and Shower Facilities

Item 3.1.7 will only be required in case of a positive exposure assessment according to Section 3.1.11 of this specification. Provide clean change rooms and shower facilities (if feasible), within the physical boundary around the designated lead control area in accordance with requirements of 29 CFR 1926.62.

3.1.8 Mechanical Ventilation System

Item 3.1.8 will only be required in case of a positive initial determination according to Section 3.1.11 of this specification. If exposure is in excess of the PEL, the following control devices may be implemented:

- a. Use adequate ventilation to control personnel exposure to lead in accordance with 29 CFR 1926.57.
- b. To the extent feasible, use fixed local exhaust ventilation connected to HEPA filters or other collection systems, approved by the certified industrial hygienist. Local exhaust ventilation systems shall be designed, constructed, installed, and maintained in accordance with ANSI Z9.2.
- c. If air from exhaust ventilation is recirculated into the workplace, the system shall have a high efficiency filter with reliable back-up filter and controls to

monitor the concentration of lead in the return air and to bypass the recirculation system automatically if it fails. Air may be recirculated only where exhaust to the outside is not feasible.

3.1.9 Personnel Protection

Item 3.1.9 will only be required in case of a positive initial determination according to Section 3.1.11 of this specification. Personnel shall wear and use protective clothing and equipment as specified herein. Eating, smoking, or drinking is not permitted in the lead control area. No one will be permitted in the lead control area unless they have been given appropriate training and protective equipment.

3.1.10 Warning Signs

Item 3.1.10 will only be required in case of a positive initial determination, according to Section 3.1.11 of this specification. Provide warning signs at approaches to lead control areas, if the exposure will be above the PEL. Locate signs at such a distance that personnel may read the sign and take the necessary precautions before entering the area. Signs shall comply with the requirements of 29 CFR 1926.62.

3.1.11 Exposure Assessment

The contractor shall comply with all provisions of 29 CFR 1926.62 (d). Until the contractor performs an employee exposure assessment, the contractor shall implement appropriate protective measures in accordance with 29 CFR 1926.62. See [table-1](#), which lists applicable paragraphs of the standard that must be addressed during the exposure assessment. It also lists requirements for when exposures are above the action level, the permissible exposure level and at any level.

The personal protective clothing and controls shall be used as long as employee exposure is greater than the PEL. The CIH will be responsible for determining the exposure level and appropriate personal protective equipment.

3.1.12 Exposure Assessment Requirements

Until an exposure assessment has been performed, the contractor shall provide the employees with the interim protection outlined in 29 CFR 1926.62.

The personal protective clothing, controls, and hygiene facilities shall be used as long as employee exposure is greater than the PEL.

3.1.13 Additional Exposure Assessment

After the initial exposure assessment, additional assessments shall be conducted whenever there has been a change of equipment, process, control, personnel, or a new task has been initiated.

3.2 WORK PROCEDURES

The contractor shall perform demolition in accordance to the demolition plan(sec 02050), and the written compliance plan (sec 1.5.3.3). Use procedures and equipment required to limit occupational and environmental exposure to lead when lead-containing paint material is removed in accordance with 29 CFR 1926.62. Dispose of paint chips, demolition debris, and associated waste in compliance with federal, state, and local requirements.

3.2.1 Personnel Exiting Procedures

Whenever personnel exit the lead-controlled area, they shall perform the following procedures and shall not leave the work place wearing any clothing or equipment worn during the work day:

- a. Vacuum themselves off using the HEPA vacuum.
- b. Remove protective clothing in the decontamination room, and place them in an approved container.
- c. Shower(if required by CIH).
- d. Change to clean clothes prior to leaving the physical boundary designated around the lead-contaminated job site.

3.2.2 Monitoring

Monitoring of airborne concentrations of lead shall be in accordance with 29 CFR 1926.62 and as specified herein. Air monitoring, testing, and reporting shall be performed by a CIH or an Industrial Hygiene (IH) Technician who is under the direction of the CIH.

- a. The CIH or the IH Technician under the direction of the CIH shall be on the job site directing the monitoring, and inspecting the work to ensure that the requirements of the Contract have been satisfied during the entire demolition operation.
- b. Take personal air monitoring samples on employees who are anticipated to have the greatest risk of exposure as determined by the CIH. In addition, take air monitoring samples on at least 25 percent of the work crew or a minimum of two employees, whichever is greater, during each work shift.
- c. Submit results of air monitoring samples, signed by the CIH, within 72 hours after the air samples are taken. Notify the Contracting Officer within 2 hours of exposure to lead at or in excess of the action level of 30 micrograms per cubic meter of air outside of the

lead control area. Contractor must notify each employee in writing of the results which represent the employees exposure as per 29 CFR 1926.62.

3.2.2.1 Monitoring During Paint Disturbance

Perform personal and area monitoring during demolition activities as required by 29 CFR 1926.62. Sufficient area monitoring shall be conducted at the physical boundary to ensure unprotected personnel are not exposed above 30 micrograms per cubic meter of air at all times. If the outside boundary lead levels are at or exceed 30 micrograms per cubic meter of air, work shall be stopped and the CIH shall immediately correct the condition(s) causing the increased levels and notify the Contracting Officer immediately. The CIH shall review the sampling data collected on that day to determine if condition(s) requires any further change in work methods. Work shall resume when approval is given by the CIH. The Contractor shall control the lead level outside of the work boundary to less than 30 micrograms per cubic meter of air at all times. At least one sample on each shift shall be taken on the downwind side of the lead control area. If adjacent areas are contaminated, clean and visually inspect contaminated areas. The CIH shall certify that the area has been cleaned of lead contamination.

3.3 NOT USED

3.4 NOT USED

3.5 CLEANUP AND DISPOSAL

3.5.1 Cleanup

Maintain surfaces of the lead control area free of accumulations of paint chips and dust. Restrict the spread of dust and debris; keep waste from being distributed over the work area. Do not dry sweep or use compressed air to clean up the area.

3.5.2 Certification

The CIH shall certify the following in writing: air monitoring results are less than 30 micrograms per cubic meter inside and outside the lead control area, the respiratory protection for the employees was adequate, the work procedures were performed in accordance with 29 CFR 1926.62, and that there were no visible accumulations of lead-contaminated paint and dust at the worksite. Do not remove the lead control area or roped-off boundary and warning signs prior to the Contracting Officer's receipt of the CIH's certification. Reclean areas showing dust or residual paint chips.

3.5.3 Testing of Lead-Containing Paint Debris

Waste Products shall be separated into the following categories:

- a. Old woodwork, walls, roofing, plaster, windows, doors, concrete block debris, (all the debris associated with the demolition of the building).
- b. Rags, sponges, mops, HEPA filters, air monitoring cartridges, scrapers, and other materials used for testing, and cleanup
- c. Disposable work clothes and respirator filters

The waste produced by demolition (only aforementioned point a) has been determined to be non hazardous waste; therefore, testing is not required and may be disposed at the Woodlawn Landfill. The Contractor must evaluate, in accordance with 40 CFR 261 for hazardous waste, the waste described on points b. and c. to determine if they are hazardous. For initial pricing purposes, it will be assumed that the items described in b. and c. above are non-hazardous, lead containing waste. If the Toxic Characteristic Leaching Procedure (TCLP) as required by 40 CFR 261 reveals that any items in b. or c. above as hazardous, an appropriate price adjustment will be negotiated in accordance with the Changes Clause.

Prior to initiation of the work and subsequent to final demolition and cleanup of the work site, soil testing will be performed to determine if the demolition project has contaminated the surface soils with lead. Remediation of contaminated soil resulting from the demolition is the sole responsibility of the contractor.

3.5.4 Disposal of Lead Contaminated Hazardous Waste

- a. Collect lead-contaminated hazardous waste, scrap, debris, bags, containers, equipment, and lead-contaminated clothing which may produce airborne concentrations of lead particles. Label the containers in accordance with 49 CFR 172. Dispose of lead-contaminated waste material at an EPA permitted hazardous waste treatment, storage, or disposal facility off Government property **after first coordinating with and having HW manifest signed by P2 Branch.**
- b. Store waste materials in U.S. Department of Transportation (49 CFR 178) approved 55-gallon drums. Properly label each drum to identify the type of waste (49 CFR 172) and the date the drum was filled. The Contracting Officer or an authorized representative will assign an area for interim storage of waste-containing drums. Do not store hazardous waste drums

in interim storage longer than 90 calendar days from the date affixed to each drum.

- c. Handle, store, transport, and dispose lead or lead-contaminated waste in accordance with 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, and 40 CFR 265. Comply with land disposal restriction notification requirements as required by 40 CFR 268.

3.5.4.1 Disposal Documentation

Submit written evidence that the hazardous waste treatment, storage, or disposal facility (TSD) is approved for lead disposal by the EPA and state or local regulatory agencies. Submit one copy of the completed manifest, signed and dated by the initial transporter in accordance with 40 CFR 262. **Manifest must be signed by the HW manager as well as transporter before leaving the installation.**

3.5.5 Disposal of Lead Contaminated Non-Hazardous Waste

Any portion of the segregated waste products which does not test as hazardous by the testing requirements stated above, may be disposed at the Woodlawn Landfill.

3.5.6 Payment for Hazardous Waste Disposal

Payment for disposal of hazardous waste will not be made until a signed copy of the manifest from the treatment or disposal facility certifying the amount of lead-containing materials delivered is returned and a copy is furnished to the Government.

Table 1: Lead Contamination Levels

OSHA Instruction CPL 2-2.58
DEC 13 1993
Office of Health Compliance Assistance

APPENDIX C
APPLICABLE PARAGRAPHS OF 1926.62

For Specific Air Lead Levels					During Assessment of Trigger Tasks
Regardless of Level	≥ AL		> PEL	> 4 X PEL	
	1 - 30 Days	> 30 Days			
1926.62(d) - Exposure Assessment and Interim Protection	1926.62(d)(4) - Monitoring Representative of Exposure for Each Exposed Employee	1926.62(j)(1)(ii) - Medical Surveillance Program	1926.62(e) - Engineering and Work Practice Controls	1926.62(g)(2) - Clean Protective Clothing Daily	1926.62(f) - Appropriate Respiratory Protection
1926.62(h) - Housekeeping	1926.62(j)(1)(i) - Initial Medical Surveillance	1926.62(j)(3) - Medical Exams and Consultation (if required)	1926.62(f) - Respiratory Protection		1926.62(g) - Protective Clothing and Equipment
1926.62(i)(5) - Handwashing Facilities	1926.62(j)(2)(ii) - Follow-up Blood Sampling		1926.62(g) - Protective Clothing and Equipment		1926.62(j)(2) - Change Areas
1926.62(i)(1)(i) - Hazcom Training (and/or 1926.21 - Safety Training and Education)	1926.62(k) - Temporary Removal Due to Elevated Blood Lead		1926.62(h) - Hygiene Facilities and Practices		1926.62(j)(5) - Handwashing Facilities
	1926.62(j)(1)(ii)-(iv) - Information and Training		1926.62(m) - Signs		1926.62(j)(1)(i) - Biological Monitoring
					1926.62(j)(1)(i) - Hazcom Training
					1926.62(j)(2)(iii) - Respirator Training
					1926.21 - Safety Training and Education

---End of Section---

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CHAPTER 3

Division 02000

Technical Requirements and Instructions

SECTION 02220
Demolition

Ft. Campbell Requirements:

Requirements in this section and Appendix A-7. [Solid Waste Disposal/Diversion Practices](#) shall apply to all construction and demolition activities at Fort Campbell. Contract specifications shall require at least a 40% diversion of demolished building materials such as wood, plumbing fixtures, electrical materials (lights and panels), windows, doors, toilet partitions, HVAC equipment, and scrap metals be diverted from the landfill. Diversion can be accomplished by deconstructing the wood buildings and components per instructions below or by moving the structure off-post.

Requirements in this section and Appendix A-10. [National emission standards for hazardous air pollutants \(NESHAP\)](#) regulatory requirements for demolition apply .

Demolition materials shall not be salvaged by the contractor and shall not be removed from the installation. Non salvageable demolition materials shall not to be transported off the installation.

Notify the PWBC Environmental Division if unknown waste is discovered during site investigations. Waste could be explosive, hazardous or toxic waste.

Dumpster service for new construction and for demolition is not provided by the installation. The contractor shall arrange for dumpster service at the Contractor's own expense.

In general, utilities are not to be abandoned in place; all abandoned utilities are to be removed. There are circumstances where this requirement does not apply. Abandonment of utilities and removal shall be a topic of discussion at design conferences.

Instructions to Designers:

- 1 Modify UFGS 02220 paragraphs to include the building demolition/diversion requirements above and modify contract specifications.

- 2 Construction specifications shall be modified to require a Building Materials Diversion Plan to be submitted and approved by PWBC.
- 3 When a project requires removal/disposal of environmentally hazardous waste generated at Fort Campbell, the PWBC Environmental Division must be involved in the permitting process. Modify project drawings and specifications paragraphs to include each of the above features as they apply to the project. Additional guidance on Environmental Requirements and Hazardous Waste Disposal Practices is contained in [Appendix A](#), and project specifications shall be modified to indicate these requirements.
- 4 National emission standards for hazardous air pollutants (NESHAP) regulatory requirements for demolition apply for asbestos abatement and most people understand that. However, in addition [NESHAP](#) notification is also required even if the operation involves removal of "non-regulated" ACM only in any amount, OR even if the operation involves no asbestos removal whatsoever. See this [EPA site](#) for specific items covered. When NESHAP items are encountered, project demolition specifications shall be modified to include the requirements identified in Appendix A.
- 5 For mercury containing light bulb disposal, insert the [Mercury Light Bulb](#) paragraph.

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The following Mercury Containing Bulbs paragraph shall be included in Spec Section 02220, Demolition in all projects:

"3.4.? Mercury Containing Light Bulbs: Mercury containing light bulbs such as mercury vapor, metal halide, high pressure sodium, and fluorescent light bulbs, or any other mercury-containing light bulbs shall be considered and handled as hazardous waste for recycle.. The contractor shall collect these old/used bulbs or tubes and very carefully deliver them to the PWBC-PPOC yard before the time of demolition of old buildings or a section of a building. For disposal and recycling of these bulbs, have the Contracting Officer's representative contact the PWBC-PPOC yard hazardous waste supervisor before delivery to the yard so that packaging requirements for transport of the bulbs can be determined."

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CHAPTER 3

Division 02000

Technical Requirements and Instructions

SECTION 02226

Removal and Salvage of Historic Building Materials

Ft. Campbell Requirements:

Historic District:

The “Clarksville Base” portion of Ft. Campbell contonment area is eligible for the National Register of Historic Places as a significant Cold War historic district. Designers are required to consult with the State Historic Preservation Office (SHPO) and the federal Advisory Council on Historic Preservation for any projects that are sited at the Clarksville Base. POC is PWBC Environmental Division Cultural Resource Manager at 270-798-7437.

Instructions to Designers:

1. Complete the requirements as they apply to specific projects.

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CHAPTER 3

Division 02000

Technical Requirements and Instructions

SECTION 02315 - 02316
Excavation, Filling and backfilling

Ft. Campbell Requirements:

Ft. Campbell requires contractors to obtain a permit for [digging and excavation](#). For MILCON projects the contractor shall coordinate all excavation activities with the construction Project Engineer. For OMA projects the contractor shall notify PWBC of scheduled excavation activities and request marking of utilities at least 3 days prior to the start of excavation work. PWBC Utilities Branch will mark underground utilities in the vicinity of the excavation no earlier than three days prior to the work being started.

Existing utility lines are not to be abandoned in place. Remove abandoned lines.

PWBC will mark gas/water/sewer/electric/steam/chill water/storm/fuel lines/drain utilities before digging begins. South Central Bell and ITBC will mark phone lines and cable TV. If contractor cuts utility lines after being marked or does not get them marked he should be responsible for making immediate repairs (to be coordinated with the appropriate Government maintenance entity or be billed for repairs if the Government makes the repairs.

If contractor cuts utility lines after being marked or does not get them marked, he is responsible for making **immediate** repairs (to be coordinated with the appropriate Government maintenance entity) or be billed for repairs if the Government makes the repairs. Repairs shall be made to the satisfaction of the appropriate government entity.

Ft. Campbell will allow a 4-8 hour utility outage if the utility is not a critical customer need and is properly coordinated and public notification is made to impacted customers. Outages shall be limited to not more than 3-4 to a customer for the contract duration. For a major outage, Ft. Campbell would advertise for at least 2 weeks prior to outage occurrence.

Avoid locating new utility lines under pavement where possible. When underground utilities are sleeved under roadways, sleeves shall be extended a minimum of 10 feet beyond the roadway on both sides to protect lines from penetration by new road signs, poles, etc.

Instructions to Designers:

1. Meet with PWBC utility people to get exact locations of utilities. Fort Campbell has a great deal of underground utility lines (both active and abandoned) that do not show up on Base utility maps. Therefore, any utilities to be installed underground must be coordinated with PWBC as soon as possible during the design process. OMA projects shall include in the contract emergency phone numbers for each utility impacted.
2. Specifications Demolition section paragraphs shall incorporate the permit and demolition requirements at all construction projects.
3. Include any [digging/excavation permits](#) being considered.

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CHAPTER 3

Division 02000

Technical Requirements and Instructions

SECTION 02364

Termiticide Treatment Measures for Subterranean Termite Control

Ft. Campbell Requirements:

Termite treatment measures shall be provided on ALL new construction projects.

Environmental quality shall be maintained in delivery, storage, application, and protection of chemicals in accordance with Ft. Campbell policies and procedures.

Instructions to Designers:

1. Point of Contact is Joe Whitfill at 270-798-9850.
2. See [Appendix A](#) for environmental requirements.
3. Specifications section UFGS 02364, paragraphs shall be included at all new construction (and additions) projects.

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CHAPTER 3

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Technical Requirements and Instructions

SECTION 02510
Water Distribution System

Ft. Campbell Requirements:

Design:

Water (and sewage) distribution systems require State of Tennessee and/or Kentucky approval. P.E. registered in Tennessee and/or Kentucky must stamp drawings. Final water system contract drawings shall be forwarded to PWBC who submits to state agencies. Requirements for designer submittals are found in [Appendix B](#) and [Appendix F](#). **Designers are NOT to contact Kentucky or Tennessee regulators.** Specifications shall require the construction contractor to notify State of Tennessee and/or Kentucky when construction starts.

Research locations and sizes of proposed utilities during design phase, then meet with PWBC utility people to investigate exact location of utilities. Fort Campbell has a great deal of underground utility lines (both active and abandoned) that do not show up on Base utility maps. Therefore, any utilities to be installed underground must be coordinated with PWBC as soon as possible during the design process. OMA projects shall include in the contract emergency phone numbers for each utility impacted.

Ft. Campbell will allow a 4-8 hour utility outage if the utility is not a critical customer need and is properly coordinated and public notification is made to impacted customers. Outages shall be limited to not more than 3-4 to a customer for the contract duration. For a major outage, Ft. Campbell would advertise for at least 2 weeks prior to outage occurrence.

Avoid locating new utility lines under pavement where possible. When underground utilities are sleeved under roadways, sleeves shall be extended a minimum of 10 feet beyond the roadway on both sides to protect lines from penetration by new road signs, poles, etc.

Additional environmental protection measures apply. See [Appendix A](#).

Distribution system features:

- Domestic water distribution lines shall be a minimum 8" diameter
- Electrical grounding shall not be accomplished at water lines.
- Provide individual meters on gas, water, and electric service lines for all buildings. Meters shall be capable of receiving a device, which will allow remote monitoring in the future.
- Conduct sterilization/flushing of new water lines. Perform bacteriological testing of new water lines.
- Avoid use of odd pipe sizes (i.e. 3").
- Trenching through roadways shall be avoided to the maximum extent possible. Whenever possible utilities shall be pressure-pumped below roadways.
- All new utility lines installed underground shall be marked with magnetic tape.
- PWBC will mark gas/water/sewer/electric/steam/chill water/storm/fuel lines/drain utilities before digging begins. South Central Bell and ITBC will mark phone lines and cable TV.
- Provide place to test water in new piping.
- Prefer Copper water service lines; will take galvanized; PVC service lines are not to be specified. Lead solder is not to be utilized.
- Locate fire hydrants in accordance with MIL HDBK 1008C. Design systems to isolate no more than two fire hydrants out of service at one time. . Fire hydrant lines shall be a minimum 6" diameter and a maximum of 300' long.
- No threaded fittings below ground.
- Loop and grid water distribution piping.
- Conduct sterilization/flushing of new water lines. Perform bacteriological testing of new water lines. Keep chlorinated water out of storm system
- Install isolation valves in new and extended distribution systems.

Construction:

Ft. Campbell requires contractors to obtain a permit for [digging and for excavation](#). For MILCON projects the contractor shall coordinate all excavation activities with the construction Project Engineer. For OMA projects the contractor shall notify PWBC of scheduled excavation activities and request marking of utilities at least 3 days prior to the start of excavation work. PWBC Utilities Branch will mark underground utilities in the vicinity of the excavation no earlier than three days prior to the work being started.

Existing utility lines are not to be abandoned in place. Remove abandoned lines.

If contractor cuts utility lines after being marked or does not get them marked, he is responsible for making **immediate** repairs (to be coordinated with the appropriate Government maintenance entity) or be billed for repairs if the Government makes the repairs. Repairs shall be made to the satisfaction of the appropriate government entity.

Instructions to Designers:

1. Point of Contact is at 270-798-5052. At the design meeting, obtain a current list of points of contact for utilities.

2. Include any [digging/excavation permits](#) being considered. Discuss notification schedule for outages.
 - Include provisions to maintain utilities when executing new work.
 - Think about constructability and coordination of demo with installation of new. Goal is not to leave an occupant or customer without service (gas, water, heat, sewer, etc.).
3. Research and confirm locations, sizes and capacities of existing infrastructure. Determine whether it will be sized sufficiently to handle new construction.
4. Design, contract drawings, and specifications Section 02510, Water Distribution System shall include all Ft. Campbell Requirements that apply to the project. The additional [Ft. Campbell Water Distribution System](#) paragraphs shall be added when applicable
5. For electronic copies of the document, contact the PE/A for MILCON and OMA projects by the COE. A-E's directly serving the installation should contact the PM.
6. Incorporate all applicable environmental considerations into the contract documents. See [Appendix A](#) and [Appendix B](#).

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The following paragraph shall be included in the WATER DISTRIBUTION SYSTEM specification:

X.X DISINFECTION

X.X.X Bacteriological Disinfection

Before acceptance of potable water operation, each unit of completed waterline shall be disinfected as prescribed by AWWA C651. From several points in the system, Contracting Officer personnel shall take water samples from different points in properly sterilized containers in accordance with AWWA requirements. Fort Campbell Water Plant personnel shall perform a bacterial examination in accordance with State of Tennessee approved methods. The disinfection shall be repeated until tests indicate the absence of pollution. The system will not be accepted until satisfactory bacteriological results have been obtained.

The following requirements shall be included where bacteriological testing is required in water lines. This testing is required after sterilization and flushing of the lines has occurred:

“At least three (3) days prior to flushing the system, the construction contractor shall contact the Ft. Campbell PWBC Utilities Office, at (270) 798-5082, to request a bacterial examination of the water system. The PWBC will obtain samples and perform the test.”

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CHAPTER 3

Division 02000

Technical Requirements and Instructions

SECTION 02531 - 02532
Sanitary Sewers

Ft. Campbell Requirements:

Design Requirements:

Sewage system additions and changes require State of Tennessee and/or Kentucky approval. PE registered in Tennessee and/or Kentucky must stamp drawings. Final sewer system contract documents and calculations shall be forwarded to PWBC who submits to state agencies. Requirements for designer submittals are found in [Appendix B](#) and [Appendix F](#). **Designers are NOT to contact Kentucky or Tennessee regulators.** Specifications shall require the construction contractor to notify State of Tennessee and/or Kentucky when construction starts.

Research locations and sizes of proposed utilities during design phase, then meet with PWBC utility people to investigate exact location of utilities. Fort Campbell has a great deal of underground utility lines (both active and abandoned) that do not show up on Base utility maps. Therefore, any utilities to be installed underground must be coordinated with PWBC as soon as possible during the design process. OMA projects shall include in the contract emergency phone numbers for each utility impacted.

Ft. Campbell will allow a 4-8 hour utility outage if the utility is not a critical customer need and is properly coordinated and public notification is made to impacted customers. Outages shall be limited to not more than 3-4 to a customer for the contract duration. For a major outage, Ft. Campbell would advertise for at least 2 weeks prior to outage occurrence.

Avoid locating new utility lines under pavement where possible. When underground utilities are sleeved under roadways, sleeves shall be extended a minimum of 10 feet beyond the roadway on both sides to protect lines from penetration by new road signs, poles, etc.

Environmental protection measures apply. See [Appendix A](#).

Do not install lift stations if possible; use gravity system unless unavoidable.

If lift station must be used see: [Special Requirements for Sewage Lift Stations](#)

Sewer system features:

- All utility lines installed underground shall be marked with magnetic tape.
- Utility lines are not to be abandoned in place. Remove abandoned lines.
- Trenching through roadways shall be avoided to the maximum extent possible..
- Verify capacity of existing infrastructure, and whether it will be sized sufficiently to handle new construction.
- Whenever possible utilities shall be pressure-pumped below roadways
- Manhole elevations shall be established to avoid interference with mowing equipment or allow water inflow during rain because manholes are low where flooding occurs.
- Utilize multiple laterals. (If one line clogs, other plumbing fixtures can still flow. Especially in housing where clogs are more of a problem due to grease/obstructions.)
- Pressure test new manholes. Low pressure air testing required for gravity sewer lines to reduce inflow/infiltration to rate of 25. (Tennessee regulation, Chapter 2.)
- Brick manholes shall not be utilized (new Tennessee requirement).

Construction:

Ft. Campbell requires contractors to obtain a permit for digging. For MILCON projects the contractor shall coordinate all excavation activities with the construction Project Engineer. For OMA projects the contractor shall notify PWBC of scheduled excavation activities and request marking of utilities at least 3 days prior to the start of excavation work. PWBC Utilities Branch will mark underground utilities in the vicinity of the excavation no earlier than three days prior to the work being started.

Existing utility lines are not to be abandoned in place. Remove abandoned lines.

If contractor cuts utility lines after being marked or does not get them marked, he is responsible for making **immediate** repairs (to be coordinated with the appropriate Government maintenance entity) or be billed for repairs if the Government makes the repairs. Repairs shall be made to the satisfaction of the appropriate government entity.

Instructions to Designers:

1. Point of Contact is Larry Martin at 270-956-1801. At the design meeting, obtain a current list of points of contact for utilities.
2. Include any [digging/excavation permits](#) being considered. Discuss notification schedule for outages.
 - Include provisions to maintain utilities when executing new work.
 - Think about constructability and coordination of demo with installation of new. Goal is not to leave an occupant or customer without service (gas, water, heat, sewer, etc.).

3. Research and confirm locations, sizes and capacities of existing infrastructure. Determine whether it will be sized sufficiently to handle new construction.
4. Incorporate all applicable environmental considerations into the contract documents. See [Appendix A](#) and [Appendix B](#).

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Special requirements for Sewage Lift Stations:

Do not install lift station if possible; use gravity system unless unavoidable.

If lift station must be used the following Special Requirements for Sewage Lift Stations apply:

- It shall be located a minimum of 150 feet from any occupied building, shall not be located in a street, and shall have adequate lighting.
- Keep electrical connections out of wet well.
- Use submersible duplex centrifugal non-clogging sewage pumps for wet pit installation. Pump shall be capable of continuous submergence and operation under dry conditions for short periods of time without adverse impacts. Use stainless steel rails on pumps. Provide separate rail for each pump.
- Pump connected automatically and firmly to discharge elbow permanently mounted on wet-well bottom.
- Pump shall have lifting chain of sufficient strength/length for easy removal for inspection/maintenance.
- Provide direct access road to the lift station. Maintenance personnel will inspect on a weekly basis. Large lift stations may require daily inspections. Place pavement or gravel around the lift station for a turn around and vehicle maintenance activities.
- Slope floor of wet well to pump suction point.
- Keep plug and check valve outside wet wells. Put outside of pump station in some sort of valve box.
- Provide potable water service to the new sewage lift stations. Is needed for wash down inside the wet well. Ensure frost proof hose bib is protected from lawn mowers, being driven over, etc.
- Provide electrical receptacle at control panel for use by maintenance personnel.
- Provide remote monitoring that is compatible with the Ft. Campbell system.
- Control panel doors shall swing open away from manhole openings.
- Control panel doors shall be provided with a heavy-duty hasp.

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Division 02000

Technical Requirements and Instructions

SECTION 02552

Pre-Engineered Underground Heat Distribution System

Ft. Campbell Requirements:

Include spec provisions to maintain utilities when executing new work. Think about constructability and coordination of demo with installation of new. Goal is not to leave an occupant or customer without service (gas, water, heat, sewer, etc.).

At design meetings, discuss what outages will be needed and for how long. Generally, Ft. Campbell will allow a 4-8 hour utility outage if the utility is not a critical customer need and is properly coordinated and public notification is made to impacted customers. Outages shall be limited to not more than 3-4 to a customer for the contract duration.

At design meetings, discuss notification schedule for outages. For a major outage, Ft. Campbell would advertise for at least 2 weeks prior to outage occurrence.

All utility lines installed underground shall be marked with magnetic tape.

Fort Campbell has a great deal of underground utility lines (both active and abandoned) that do not show up on Base utility maps. Therefore, any utilities to be installed underground must be coordinated with PWBC as soon as possible during the design process.

Utility lines are not to be abandoned in place. Remove abandoned lines.

Trenching through roadways shall be avoided to the maximum extent possible. Whenever possible utilities shall be pressure-pumped below roadways.

Ft. Campbell requires permit for digging. For MILCON projects the contractor shall coordinate all excavation activities with the construction Project Engineer. For OMA projects the contractor shall notify PWBC of scheduled excavation activities and request marking of utilities at least 3 days prior to the start of excavation work. PWBC Utilities Branch will mark underground utilities in the vicinity of the excavation no earlier than three days prior to the work being started.

PWBC will mark gas/water/sewer/electric/steam/chill water/storm/fuel lines/drain utilities before digging begins. South Central Bell and ITBC will mark phone lines and cable TV. If contractor cuts utility lines after being marked or does not get them marked he should be responsible for making immediate repairs (to be coordinated with the appropriate Government maintenance entity or be billed for repairs if the Government makes the repairs.

Include in contract requirements stating that the contractor is responsible for **IMMEDIATE** repair of existing project site utility lines broken during construction. Repairs shall be made to the satisfaction of the appropriate government entity.

OMA projects shall include in the contract phone numbers for each utility that contractor is to use in case of an emergency.

Instructions to Designers:

1. Point of Contact is Larry Martin at 270-956-1801.
4. Include Discussions of any digging /excavation being considered at the design Meeting.
5. At the design meeting, obtain a current list of points of contact for utilities.
6. Design, contract drawings, and specifications section UFGS 02770 paragraphs shall include each of the above features as they apply to the project.

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Division 02000

Technical Requirements and Instructions

SECTION 02556
Gas Distribution System

Ft. Campbell Requirements:

Design:

Fort Campbell has a great deal of underground utility lines (both active and abandoned) that do not show up on Base utility maps. Therefore, any utilities to be installed underground must be coordinated with PWBC as soon as possible during the design process.

Verify capacity of existing infrastructure, and whether it will be sized sufficiently to handle new construction.

At design meetings, discuss what outages will be needed and for how long. Generally, Ft. Campbell will allow a 4-8 hour utility outage if the utility is not a critical customer need and is properly coordinated and public notification is made to impacted customers. Outages shall be limited to not more than 3-4 to a customer for the contract duration. For a major outage, Ft. Campbell would advertise for at least 2 weeks prior to outage occurrence.

Include provisions to maintain utilities when executing new work. Think about constructability and coordination of demo with installation of new. Goal is not to leave an occupant or customer without service (gas, water, heat, sewer, etc.).

Provide individual meters on gas, water, and electric service lines for all buildings. Meters shall be capable of receiving a device, which will allow remote monitoring in the future. For most buildings, use residential type gas meter. 3/16" orifice, output range of 5-1/2 to 8-1/2 inches of water column, normally set at 8" W.C.

Additional requirements are found in [Appendix A.](#) and [Appendix F.](#)

Design Criteria:

- Use only 1 regulator to drop pressure from 28lb to 8" W.C. then install the meter.

- Use of plastic piping for gas line mains of up to 6" may be used. Gas lines of 8" and greater shall be steel. If steel piping is used provide insulated flange at building. Cathodic protection shall be provided for steel piping.
- **New requirements with public gas utility company:**
 - Install gas piping to operate at 60 psig. Request you make changeorders to on-going work to the maximum extent possible. This is the system operating pressure. If the decision is for the Gov't to retain ownership, we will also move to this system pressure.
 - Pressure testing new piping at 1.5 (120 psig) times maximum rating of the new pipe.
 - Gas systems must be pressure tested at original construction and documented (records are required to be kept for the life of the system).

Construction:

Trenching through roadways shall be avoided to the maximum extent possible. Whenever possible utilities shall be pressure-pumped below roadways.

All utility lines installed underground shall be marked with magnetic tape.

Utility lines are not to be abandoned in place. Remove abandoned lines.

Require use of Kerotest for underground gas lines. [Retain and forward ALL PAPERWORK associated with new gas piping and testing to \(Utilities Branch of PWBC\) directly!](#)

Ft. Campbell requires permit for digging. For MILCON projects the contractor shall coordinate all excavation activities with the construction Project Engineer. For OMA projects the contractor shall notify PWBC of scheduled excavation activities and request marking of utilities at least 3 days prior to the start of excavation work. PWBC Utilities Branch will mark underground utilities in the vicinity of the excavation no earlier than three days prior to the work being started.

Include in contract requirements stating that the contractor is responsible for **IMMEDIATE** repair of existing project site utility lines broken during construction. Repairs shall be made to the satisfaction of the appropriate government entity.

OMA projects shall include in the contract phone numbers for each utility that contractor is to use in case of an emergency.

Instructions to Designers:

1. Point of Contact at PWBC is Larry Martin at 270-956-1801.
2. Research locations and sizes of proposed utilities during design phase, then meet with PWBC utility people to investigate exact location of utilities.

3. Include any [digging/excavation permits](#).
4. At the design meeting, obtain a current list of points of contact for utilities.
5. Design, contract drawings, and specifications section UFGS 02770 paragraphs shall include each of the above features as they apply to the project.

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SECTION 02630 Storm Drainage System

Ft. Campbell Requirements:

Verify capacity of existing infrastructure, and whether it will be sized sufficiently to handle new construction.

Drainage of downspouts into storm sewer is encouraged in order to prevent erosion.

Include provisions to maintain utilities when executing new work. Think about constructability and coordination of demo with installation of new. Goal is not to leave an occupant or customer without service (gas, water, heat, sewer, etc.).

Avoid use of odd pipe sizes (i.e. 3").

Trenching through roadways shall be avoided to the maximum extent possible. Whenever possible utilities shall be pressure-pumped below roadways.

All utility lines installed underground shall be marked with magnetic tape.

Include in contract requirements stating that the contractor is responsible for **IMMEDIATE** repair of existing project site utility lines broken during construction. Repairs shall be made to the satisfaction of the appropriate government entity.

OMA projects shall include in the contract phone numbers for each utility that contractor is to use in case of an emergency.

Additional Requirements are found in [Appendix A, Clean Water.](#)

Instructions to Designers:

1. Point of Contact is Larry Martin at 270-956-1801.
2. Include any [digging/excavation permits](#).
3. At the design meeting, obtain a current list of points of contact for utilities.

4. Design, contract drawings, and specifications section UFGS 02630 paragraphs shall include each of the above features as they apply to the project.

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Technical Requirements and Instructions

SECTION 02744-02745
Bituminous Roadways

Ft. Campbell Requirements:

Corps of Engineers Guide Specifications shall be used and modified to reference "KDOT" for Asphalt pavement through out the installation except for Airfield pavements.

All new facilities should include waste handling equipment, concrete pads and screens as necessary. The designer should have some idea of the volume of waste to be generated by the final permanent facility. If the facility will generate recyclable materials, capacity for recyclable bins should be included.

Instructions to Designers:

1. Design, contract drawings, and specifications paragraphs shall include each of the above features as they apply to the project.
2. Include any [digging/excavation permits](#).

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Technical Requirements and Instructions

SECTION 02753 - 02754
Concrete Pavements

Ft. Campbell Requirements:

Fort Campbell has experienced unsatisfactory life and performance in exterior concrete pavements due to alkali-silica reaction (ASR). ASR causes excessive expansion of concrete, leading to degraded load capacity, surface spalling, and eventual premature pavement failure. Secondary damage includes displacing adjoining vertical construction applying threatening lateral loads on adjacent embedded and pavement features.

Concrete for exterior pavements and hardstand areas shall specify and require only low alkali Portland Cement with Class F fly ash as the pozzolanic cement replacement and Ground Granulated Blast-Furnace (GGBF) Slag in combination for the concrete mix design test proportioning. Specific concrete mixture proportions have been developed for concrete pavement in an attempt to mitigate concrete expansion problems currently being experienced at the base.

Instructions to Designers:

1. Design, contract drawings, and specifications paragraphs shall include each of the above features as they apply to the project.
2. For new construction projects having concrete pavement for parking hardstand areas, roadways, airfield runways and aprons, one of the following Louisville District COE, Engineering Division technical elements -- ED-T, ED-TC and/or ED-TG -- shall be consulted. These elements will provide specific design instructions and review all site related concrete specifications.
3. Include any [digging/excavation permits](#).

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Technical Requirements and Instructions

SECTION 02770

Concrete Sidewalks and Curbs and Gutters

Ft. Campbell Requirements:

Use of curbs and gutters is encouraged especially at road corners and radius. Use of parking blocks is not encouraged as this inhibits snow removal.

Handicapped curb ramps must meet ADA requirements.

Concrete for exterior pavements and hardstand areas shall use Class F fly ash as the pozzolanic cement replacement. Specific concrete mixture proportions have also been developed for these features in an attempt to mitigate concrete expansion problems currently being experienced at the base.

All new facilities shall include waste handling equipment, concrete pads and screens as necessary. The designer should have some idea of the volume of waste to be generated by the final permanent facility. If the facility will generate recyclable materials, capacity for recyclable bins should be included

Instructions to Designers:

3. Design, contract drawings, and specifications shall include each of the above features as they apply to the project.
 1. For MILCON projects, COE in-house units ED-TC and ED-TS shall be consulted for review of all site related concrete specifications.
 2. Include any [digging/excavation permits](#).

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Technical Requirements and Instructions

SECTION 02930
Exterior Planting

Ft. Campbell Requirements:

Installation grounds keeping is limited. Maintenance free design around facilities and plant areas is required.

Ensure that the landscaping provided does not interfere with overhead power lines when it reaches maturity.

Fort Campbell maintains lists of suitable plant materials for use at the installation. These lists are subdivided into plant sizes. The following Ft. Campbell Landscape Plant Lists are in Appendix E.

[Native Evergreens/Conifers](#)

[Native Deciduous](#)

[Introduced Evergreens](#)

[Introduced Deciduous](#)

Instructions to Designers:

1. Design, contract drawings, and specifications shall include only approved and listed plant materials.
2. Point of Contact for Landscaping is Linda Alderdice at 270-798-2616

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03300	<u>Cast-In-Place Structural Concrete</u>
03307	<u>Concrete for Minor Structures</u>
03330	<u>Cast-In-Place Architectural Concrete</u>

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Division 03000

Technical Requirements and Instructions

SECTION 03300
Cast-In-Place Structural Concrete

Ft. Campbell Requirements:

Concrete used in masonry bond beams should be 9/11 slump and contain plastiziser.

Concrete shall use Class F fly ash as the pozzolanic cement replacement.

To accommodate environmental Radon protection, all specification items identified as “vapor barrier” shall be modified to read “vapor/radon barrier”

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CHAPTER 3

Division 03000

Technical Requirements and Instructions

SECTION 03307
Concrete For Minor Structures

Ft. Campbell Requirements:

Concrete used in masonry bond beams should be 9/11 slump and contain plastiziser.

Concrete shall use Class F fly ash as the pozzolanic cement replacement.

To accommodate environmental Radon protection, all specification items identified as “vapor barrier” shall be modified to read “vapor/radon barrier”

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Division 03000

Technical Requirements and Instructions

SECTION 03330
Cast-In-Place Architectural Concrete

Ft. Campbell Requirements:

Concrete shall use Class F fly ash as the pozzolanic cement replacement.

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04200 [Masonry](#)

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SECTION 04200
Masonry

Ft. Campbell Requirements:

All exterior split faced units shall be fabricated with integral water repellant and shall be integrally colored during manufacture. Water repellant primer and stain shall also be applied to all exterior split faced CMU after completion of exterior work and split face is not subject to damage by construction activities.

Block filler shall be used on all exposed CMU.

Modify specifications section 04200, Masonry, to incorporate the following paragraphs, specifically including all items highlighted in red:

See Appendix D: [Exterior Finishes](#).

2.4.2.1 Architectural Units

Units shall have patterned face shell. Face shell pattern shall be [fluted] [vertical scored] [split ribbed] [_____]. **All exterior architectural units shall be fabricated with integral water repellant and shall be integrally colored during manufacture. Water repellant primer and stain shall also be applied to all exterior architectural CMU walls after completion of exterior work and when the masonry is not subject to damage by construction activities.**

~~Units shall be integrally colored during manufacture. Color shall be [_____]. Patterned face shell shall be properly aligned in the completed wall.~~

2.10 MORTAR

Mortar shall be Type [S] [N] in accordance with the proportion specification of ASTM C 270 except Type S cement-lime mortar proportions shall be 1 part cement, 1/2 part lime and 4-1/2 parts aggregate; Type N cement-lime mortar proportions shall be 1 part cement, 1 part lime and 6 parts aggregate; when masonry cement ASTM C 91 is used the maximum air content shall be limited to 12 percent and performance equal to cement-lime mortar shall be verified. Verification of masonry cement performance shall be based on ASTM C 780 and ASTM C 1072. Mortar for prefaced concrete masonry unit wainscots shall contain aggregates with 100 percent passing the 2.36 mm No. 8 sieve and 95 percent passing the 1.18 mm No. 16 sieve. Pointing mortar in showers and kitchens shall contain ammonium stearate, or aluminum tri-stearate, or calcium stearate in an amount equal to 3 percent by weight of cement used. Cement shall have a low alkali content and be of one brand. Aggregates shall be from one source. **Efflorescence testing of mortar shall be in accordance with ASTM C 67. Any component causing efflorescence shall be rejected.**

2.11 GROUT

Grout shall conform to ASTM C 476. Cement used in grout shall have a low alkali content. Grout slump shall be between 200 and 250 mm. 8 and 10 inches. Grout shall be used subject to the limitations of Table III. Proportions shall not be changed and materials with different physical or chemical characteristics shall not be used in grout for the work unless additional evidence is furnished that the grout meets the specified requirements. **Efflorescence testing of mortar shall be in accordance with ASTM C 67. Any component causing efflorescence shall be rejected.**

3.26.3 Efflorescence Test

Brick, **split faced and scored CMU** which will be exposed to weathering shall be tested for efflorescence. Tests shall be scheduled far enough in advance of starting masonry work to permit retesting if necessary. Sampling and testing shall conform to the applicable provisions of ASTM C 67. Units meeting the definition of "effloresced" will be subject to rejection.

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05500 [Metals](#)

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SECTION 05500
Metals

Ft. Campbell Requirements:

Avoid painted handrailings and guardrails. Use unpainted galvanized (exterior), stainless steel or aluminum railings (interior).

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06200 [Finish Carpentry](#)

06650 [Solid Polymer \(solid Surfacing\) Fabrications](#)

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Technical Requirements and Instructions

SECTION 06200
Finish Carpentry

Ft. Campbell Requirements:

Use finished or painted wood trim instead of plastic for chair rails, and other decorative locations.

PWBC is using wood veneer casework instead of plastic laminate on O&M projects.

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Division 06000

Technical Requirements and Instructions

SECTION 06650
Solid Polymer Fabrications

Ft. Campbell Requirements:

Prefer using solid surfacing on counter tops and possibly on windowsills for more scratch and stain resistance.

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07240	<u>Exterior Insulation and Finish System</u>
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07412	<u>Non-Structural Metal Roofing</u>
07416	<u>Structural Standing seam Metal Roofing (SSSMR)</u>
07510	<u>Built-Up Roofing</u>
07530	<u>Elastomeric Roofing (EPDM)</u>
07551	<u>Modified Bitumen Roofing</u>

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Division 07000

Technical Requirements and Instructions

SECTION 07240
Exterior Insulation and Finish System

Ft. Campbell Requirements:

Use of these systems is discouraged for new construction.

When used for existing construction, a stone or brick base shall be used to reduce damage/deterioration caused by exterior landscaping maintenance and mowing/trimming grounds keeping.

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Division 07000

Technical Requirements and Instructions

SECTION 07311 Roofing, Strip Shingles

Ft. Campbell Requirements:

Shingles shall be of simple seal-down 3-tab design. Use only light colors, and maximum life quality. Minimum slope for shingles shall conform to manufacturer recommendations.

Flat built-up roofs are not to be utilized in new roof system designs. Minimum low slope for roofs shall be ½ inch per foot.

Modified bitumen is the preferred membrane on low slope roof conditions for recover, replacement, and new installations.

The roof specification shall require the contractor to test new roofing systems by flooding roofs with interior gutters and to fire hose-spray exterior gutter roofs to insure water tightness.

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Division 07000

Technical Requirements and Instructions

SECTION 07412
Non-Structural Metal Roofing

Ft. Campbell Requirements:

Metal roofing shall be vertical seam with UL class 90 uplift approval.

Color shall conform to Ft. Campbell approved standard schemes. See Appendix D

The roof specification shall require the contractor to test new roofing systems by flooding roofs with interior gutters and to fire hose-spray exterior gutter roofs to insure water tightness.

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Division 07000

Technical Requirements and Instructions

SECTION 07416 Structural Standing Seam Metal Roof System

Ft. Campbell Requirements:

Metal roofing shall be vertical seam with ASTM E 1592 uplift approval.

Color shall conform to Ft. Campbell approved standard schemes. See Appendix D

The roof specification shall require the contractor to test new roofing systems by flooding roofs with interior gutters and to fire hose-spray exterior gutter roofs to insure water tightness.

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CHAPTER 3

Division 07000

Technical Requirements and Instructions

SECTION 07510 Built-up Roofing

Ft. Campbell Requirements:

Flat no-slope built-up roof systems are not to be utilized in new facility designs.

Minimum low slope for new roofs shall be ½ inch per foot.

Modified bitumen is the preferred membrane on low slope roof conditions for recover, replacement, and new installations.

The roof specification shall require the contractor to test new roofing systems by flooding roofs with interior gutters and to fire hose-spray exterior gutter roofs to insure water tightness.

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Division 07000

Technical Requirements and Instructions

SECTION 07530 Elastomeric Roofing (EPDM)

Ft. Campbell Requirements:

Flat no-slope built-up roof systems are not to be utilized in new facility designs.

Minimum low slope for new roofs shall be ½ inch per foot.

Modified bitumen is the preferred membrane on low slope roof conditions for recover, replacement, and new installations.

The roof specification shall require the contractor to test new roofing systems by flooding roofs with interior gutters and to fire hose-spray exterior gutter roofs to insure water tightness.

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Division 07000

Technical Requirements and Instructions

SECTION 07551 Modified Bitumen Roofing

Ft. Campbell Requirements:

Flat no-slope built-up roof systems are not to be utilized in new facility designs.

Minimum low slope for new roofs shall be ½ inch per foot.

Modified bitumen is the preferred membrane on low slope roof conditions for recover, replacement, and new installations.

The roof specification shall require the contractor to test new roofing systems by flooding roofs with interior gutters and to fire hose-spray exterior gutter roofs to insure water tightness.

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08360	<u>Overhead Sectional doors</u>
08700	<u>Hardware</u>

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CHAPTER 3

Division 08000

Technical Requirements and Instructions

SECTION 08330 - 08331
Overhead Coiling/Rolling Doors

Ft. Campbell Requirements:

Door manufacturer representative shall conduct a final inspection of the door installation(s) and certify the installation is complete and correct, and meets all requirements for the full warranty.

Instructions to Designers:

1. Modify UFGS 08331 paragraphs to include the on-site visit and verification requirement.
3. Modify the UFGS 08331 paragraphs to include a certification of inspection by the door manufacturer representative.

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Technical Requirements and Instructions

SECTION 08360
Overhead Sectional Doors

Ft. Campbell Requirements:

Door manufacturer representative shall conduct a final inspection of the door installation(s) and certify the installation is complete and correct, and meets all requirements for the full warranty.

Instructions to Designers:

1. Modify UFGS 08360 paragraphs to include the on-site visit and verification requirement.
2. Modify the UFGS 08360 paragraphs to include a certification of inspection by the door manufacturer representative.

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Division 08000

Technical Requirements and Instructions

SECTION 08700
Hardware

Ft. Campbell Requirements:

Fort Campbell utilizes an "I/C - 7 pin Insta-Key" integrated master keying system. Interchangeable cores provided shall be compatible with the existing "I/C - 7 pin Insta-Key" system. The I/C - 7 pin Insta-Key lock system is the standard lock system for Troop

housing. Combination locks used in secured areas shall be Mass Hamilton X09 type. The "I/C - 7 pin Insta-Key" system is *also* encouraged for all other building types. Biting list is to be added to keying schedule. Four blank keys are to be provided with each change key.

Electric locks shall be stand alone Schlage CM5596 Series or adaptable to that system.

Prefer knobs instead of levers.

Panic device hardware shall be touch pad type.

Install kickplates on doors in heavy use areas.

Concealed door closers shall not be avoided without prior PWBC approval.

Require door stops at all interior and exterior locations.

Use and specify Hasp and Pad locks on exterior doors to mechanical/ electrical rooms.

Electrical Pad-mounted Transformer locks shall be included in the contract.

Furniture locks are repaired/replaced *on case by case basis* by the Ft. Campbell Lockmaster. No standardization of furniture locks is possible.

Instructions to Designers:

1. Modify specifications paragraphs to include each of the above features as they apply to the project.
2. The Installation POC regarding keys is *Mr. Ayers* (270) 798-3581.

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09000	<u>Finishes, General</u>
09900	<u>Painting, General</u>

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SECTION 09000
Finishes, General

Ft. Campbell Requirements:

Exterior and interior finishes shall conform to [Appendix D.](#)

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Technical Requirements and Instructions

SECTION 09900
Paint, General

Ft. Campbell Requirements:

Use of semi-gloss, eggshell, and other enamelized paint finishes shall be maximized.
Use of flat paints shall be minimized.

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10160	<u>Toilet Partitions</u>
10430	<u>Exterior Signage</u>
10440	<u>Interior Signage</u>
10800	<u>Toilet Accessories</u>

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CHAPTER 3

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Technical Requirements and Instructions

SECTION 10160
Toilet Partitions

Ft. Campbell Requirements:

Use of solid phenolic partitions is encouraged.

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Technical Requirements and Instructions

SECTION 10430 Exterior Signage

Ft. Campbell Requirements:

Exterior signage is classified into three major categories:

- Facility Identification Signage
- Directional and Street Signage
- Regulatory Signage

All Sign sizes and styles and locations shall be in accordance with the ACSIM [Installation Design Standards](#), Signage/Graphics.

Identification signage shall be metal post and panel type and will be included in the construction contract. Graphics and lettering will not be included in the construction contract, but will be furnished and installed by the Fort Campbell Sign Shop.

Signs applied to the facilities such as building number signage shall be metal and shall be furnished and installed in the construction contract.

Four building number signs are required at four corners of each facility. Signs identifying locations of each "Mechanical Room" is required.

Projects that include new roads, shall also include street signage in the construction contract.

Instructions to Designers

1. Incorporate the above Fort Campbell requirements into the project specifications.

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Division 10000

Technical Requirements and Instructions

SECTION 10440 Interior Signage

Ft. Campbell Requirements:

If "addressable" fire alarm system is not used for a building, provide a building map identifying fire alarm zones and mount on wall next to fire alarm system panel.

Interior Designer shall (re)number building spaces for "wayfinding" and provide the information to signage subcontractor on construction drawings.

When interior signage is renumbered from the construction drawing room numbering sequence to accommodate "wayfinding", provide original construction drawing room number in metal slot mounted above door of each room for fire and maintenance purposes when construction drawings typically would be referenced. This confusing problem can be overcome by having "wayfinding" numbering from the beginning of design.

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Technical Requirements and Instructions

SECTION 10800 Toilet Accessories

Ft. Campbell Requirements:

Accessories shall not have keyed locking devices.

Toilet tissue dispensers shall be a simple design similar to Bobrick Washroom Equipment, Inc. number B-685 and B-686 series accessories.

Trash receptacles provided in restrooms shall have lids.

Sanitary napkin and tampon dispensers shall not be provided.

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11400 [Food Service Equipment](#)

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SECTION 11400
Food Service Equipment

Ft. Campbell Requirements:

Kitchen facilities that use deep fat frying equipment should have equipment for extracting and storing the used cooking oil.

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13100	<u>Lightning Protection System</u>
13120 - 13121	<u>Metal Buildings</u>
13202 – 13216	<u>Petroleum/Fuel Storage Tanks</u>
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13900	<u>Fire Protection systems</u>

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Technical Requirements and Instructions

SECTION 13100
Lightning Protection

Ft. Campbell Requirements:

Lightning Protection Systems and Snow Guards

1. Facilities Requiring Lightning Protection Systems

1.1 Priority level 1. Must have lightning protection.

a) Any facility involved with children, example schools or child development structures

b) Communications facilities

c) Facilities which houses large amounts of computer processing equipment

d) Facilities which are in isolated areas away from other large structures or wooded areas.

1.2 Priority level 2. These structures are to be evaluated on an as-needed basis with the recommendations from Ft. Campbell's fire marshal and DPW.

a) Barracks

b) Maintenance facilities

c) Family Housing

d) Administration buildings

2. Lightning Protection System Installation Methods

2.1 Lightning protection equipment manufacturer's mechanical clamps/supports for air terminal base and roof conductor installation shall be the preferred method for all our projects. The use of adhesives in lieu of mechanical clamps/supports is

an acceptable method for lightning protection equipment installation provided the following are met:

- a) Roof design/construction does not allow or makes it physically impossible for the mechanical clamps to be utilized.
- b) A variance from the original contract requirements is submitted by the Contractor indicating the type of adhesive and the reason for such variance. Corps must approve.
- c) The proposed adhesive is listed as an approved compound by both the lightning system and roofing manufacturer.
- d) All prep-work and application requirements are carefully followed in accordance with adhesive and roofing manufacturer instructions.

2.2 The use of the S-5 clamps (Cube) is an acceptable method for lightning protection equipment support provided the following are met:

- a) 1.2 a) above is met.
- b) A variance from the original contract requirements is submitted by the Contractor, with installation details, and the reason for such variance. Corps must approve.
- c) The cube is used only as a means for support of the lightning protection equipment and does not compromise the "Lightning Protection System" requirements listed under NFPA 70, NFPA 780, UL 96, and UL 96A.
- d) The cube does not void roofing manufacturer's warranty.

3.0 Snow Guards

Regardless of the manner or configuration of the mounting of a lightning protection system and equipment, the components are not intended to withstand the forces exerted by masses of ice and snow shifting on the roof. In those instances where lightning protection systems will be exposed to such forces, we recommend the installation of snow guards or snow guard systems.

Instructions to Designers:

1. For metal roofing systems, modify UFGS 13100 paragraphs to include the building lightning protection requirements above.
2. Construction contract drawings shall include the requirements lightning protection features identified above for projects having metal roof systems.

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Technical Requirements and Instructions

SECTION 13120 - 13121
Metal Buildings

Ft. Campbell Requirements:

For new construction, pre-engineered metal structural frames/buildings shall not be structurally tied to masonry. If tied, frame deflection must be limited to $L/600$, which increases steel frame cost to the point which it exceeds the cost of a designed structure. This fact has been verified by metal building manufacturers, and precludes perceived advantages of pre-engineered structural systems.

See [Appendix D](#) for colors.

See: [TI 809-30, Metal Building Systems](#)

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Technical Requirements and Instructions

SECTION 13202 - 13216
Petroleum/Fuel Storage Tanks

Ft. Campbell Requirements:

New tank installations and replacements shall comply with Section 2.1.3, [Underground and Aboveground Storage Tanks](#).

Construction permits are necessary for all petroleum/fuel storage systems. Permits require Environmental Division design review and approval.

Instructions to Designers:

1. Contact the Public Works Business Center, Environmental Division, Authority Having Jurisdiction for storage tanks prior to starting and submitting design proposals.
2. Modify project specifications to include requirements identified above.

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Division 13000

Technical Requirements and Instructions

SECTION 13280 Asbestos Abatement

Ft. Campbell Requirements:

Asbestos Abatement shall be accomplished in accordance with Fort Campbell requirements identified in specification section 02080: [Removal and Disposal of Asbestos Containing Materials](#).

Section 02080 requirements should be combined and incorporated into the UFGS 13280 section, or the Section 02080 may be renumbered. Requirements of both sections should be coordinated.

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Technical Requirements and Instructions

SECTION 13281
Lead Hazard Control Activities

Ft. Campbell Requirements:

Lead Abatement shall be accomplished in accordance with Fort Campbell requirements identified in specification section 02090: [Removal and Disposal of Lead Containing Materials](#)

Section 02090 requirements should be combined and incorporated into the UFGS 13281 section, or the Section 02090 may be renumbered. Requirements of both sections should be coordinated.

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Technical Requirements and Instructions

SECTION 13721
Small Intrusion Detection System

Ft. Campbell Requirements:

No electric equipment shall be installed within or on any Fort Campbell building, structure, or premises, nor shall any alteration or addition be made in any such existing equipment without first securing an Electrical Permit (FC Form 4183) from the Fort Campbell Electrical Inspector in accordance with Fort Campbell Public Works Business Center Standing Operating Procedure (SOP) 308, except as provided within said SOP. Copies of SOP and permits shall be obtained at PWBC, Operations and Maintenance Division, Building 867, 16th Street, Fort Campbell, Kentucky.

In addition to a phone jack inside the arms vault, place an additional phone jack outside the arms vault. The phone line in the arms vault shall be a single line only (no multiple lines on the same phone).

Instructions to Designers:

1. Installation of ICIDS Equipment in secure communications rooms shall be in accordance with instructions found in [Section 16700+: Telecommunications Systems](#).

2. Installation of ICIDS Equipment in Arms Room shall be in accordance with the following instructions and [Floor Plan Sketch](#):

- Modify project specifications to insure Contractor will provide all materials (excluding the RADC, Keypad, LED indicator lamp, and sensors)
- Modify specifications to insure Contractor will schedule a meeting with the Alarm Administrator prior to commencement of work (270) 798-3990/1225/7587 Note: Type & placement of sensors will be noted at meeting.

1. Mount the Remote Area Data Collector (RADC) to the same side as the interior door opens, approximately two feet to the left or right of the door and five feet up from the floor. (Physical Security office will provide the RADC.)

2. Mount a four square box to the left or right of door as in step one approximately one foot from the doorframe and five feet up from the floor. Half inch EMT must be run from the four square box to the bottom of the RADC can.

This is for the mounting the Keypad. (Physical Security will provide and install the keypad.)

3. A foursquare must be mounted to the ceiling (center) of the Arms Room or rear wall facing the door depending on the type of motion sensor to be used. Half inch EMT must be run from the foursquare to the RADC can (top). Note: Placement of sensors will be noted at time of meeting. (Physical Security will provide and install sensors)
4. Drill a half inch hole approximately eighteen inches above and centered on the arms room door to outside for mounting of the LED indicator lamp. (Physical Security will provide and install the LED.) Mount a foursquare box over the drilled hole and run half inch EMT from box to the RADC can (top).
5. Dedicated 120 VAC power must be run to the RADC can through $\frac{1}{2}$ " or $\frac{3}{4}$ " EMT.
6. A dedicated phone line must also be run to the RADC can. This wire can be run using the conduit from either sensor.
7. A four conductor 22 AWG wire must be run from motion sensor to the RADC.
8. A two conductor 22 AWG wire must be run from foursquare above arms room door to the RADC. This is for the Balanced Magnetic Switch (BMS) for the door. (Physical Security will provide and install the BMS.)
9. A two conductor 22 AWG wire must be run from the foursquare above door to the foursquare for the keypad installation. This is for the LED indicator to be mounted on the outside of the arms room.
10. A two conductor 22 AWG wire must be run from the foursquare, for the keypad, to the RADC.
11. A two conductor shielded 24 AWG wire must be run from the foursquare for the keypad to the RADC.

NOTE: Leave approximately four feet of wire at both ends.

Conductors

11.1 Signal wiring: Type of wire to be used (another manufacturer's wire, of equal quality, can be substituted).

West Penn 220 = 2 conductor 22 AWG

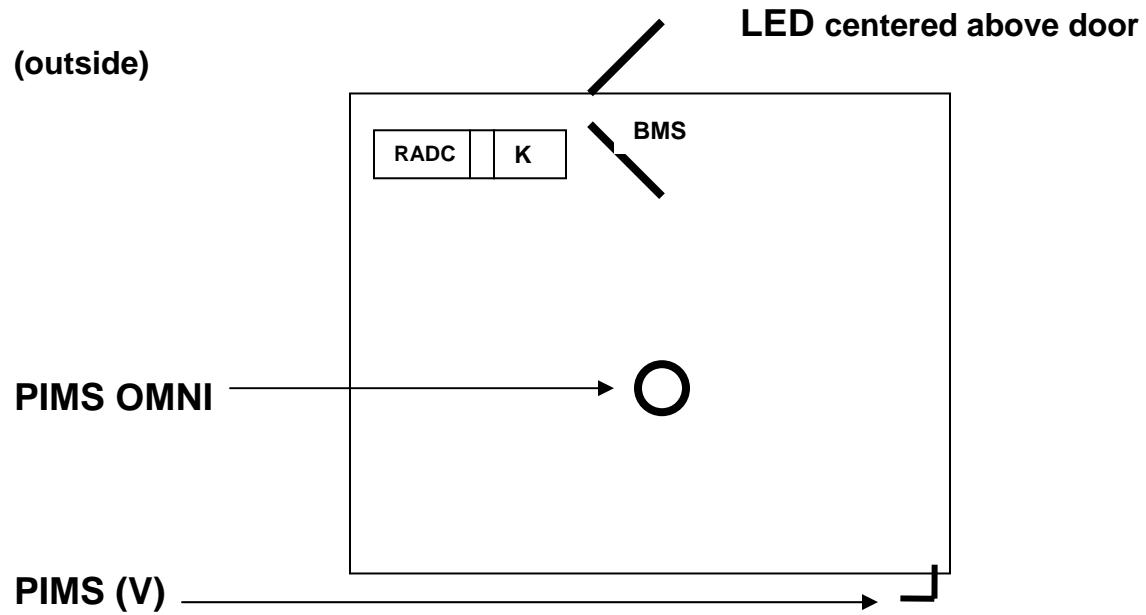
West Penn 240 = 4 conductor 22 AWG

West Penn 2401 = 2 conductor, 24 AWG, shielded

11.2 Power wiring: Black, Red, Green- 12 AWG, stranded, to RADC.

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Installation Floor Plan Sketch
ICIDS Equipment Typical Arms Room



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Technical Requirements and Instructions

SECTION 13801
Energy Monitoring and Control System (EMCS)

Ft. Campbell Requirements:

Refer to Division 16000 for electrical work.

Connect all new building controls to the EMCS unless directed otherwise.

Refer to Section 15951 for connection requirements.

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SECTION 13801
Energy Monitoring and Control System (EMCS)

Ft. Campbell Requirements:

Refer to Division 16000 for electrical work.

Connect all new building controls to the EMCS unless directed otherwise.

Refer to Section 15951 for connection requirements.

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Technical Requirements and Instructions

SECTION 13850 - 13851
Fire Detection and Alarm Systems

Ft. Campbell Requirements:

General:

No electric equipment shall be installed within or on any Fort Campbell building, structure, or premises, nor shall any alteration or addition be made in any such existing equipment without first securing an Electrical Permit (FC Form 4183) from the Fort Campbell Electrical Inspector in accordance with Fort Campbell Public Works Business Center Standing Operating Procedure (SOP) 308, except as provided within said SOP. Copies of SOP and permits shall be obtained at PWBC, Operations and Maintenance Division, Building 867, 16th Street, Fort Campbell, Kentucky.

All building designs which have a fire alarm system shall have an exterior strobe light alarm device mounted on the street side of the building's exterior. The strobe is to act as a visual indicator to responding fire crew. Response time is decreased since the crew does not need to find the actual building number.

If using flow switch, use only electric bell; do not specify motor gong; Be sure sprinkler alarm specification and alarm specification agree.

No tower is to be designed with out jockey pumps.

Ft. Campbell's fire truck ladder is 85 feet long.

Utilize looped and grid systems.

Fire Alarm Systems:

The Fire Alarm Control Panel shall be fully compatible with the existing King-Fisher Industrial Radio Alarm Control System (IRACS) presently in use at Fort Campbell. The fire alarm AM transmitter shall be Government furnished, contractor installed.

An addressable system is fine in almost any building, there are several circumstances where an addressable system is not really necessary and ends up costing more to install and maintain than it is really worth. Therefore, addressable systems shall be installed in all barracks and hangar type buildings. Non-addressable systems will be used in

maintenance facilities as well as dining facilities. Non-addressable systems shall also be designed/installed in admin buildings, which are smaller or equal to 15,000 SF with 40-50 rooms. Any admin buildings which exceed these parameters shall receive an addressable system.

Panel boxes within a building should be keyed alike. (12/21/00)

Panel boxes should be keyed alike.

Fire detection and alarm systems shall be able to be programmed from the control panel and shall not require a peripheral device (such as a laptop computer) to program them.

Do not design remote fire alarm annunciators into the fire detection and alarm system.

Fire alarm control panels shall be installed only in electrical rooms with access from the outside of the building.

Ensure that smoke detector locations shown on drawings comply with the appropriate NFPA requirements. Contractors typically simply scale locations off drawings without verifying whether the locations actually comply with NFPA location / spacing criteria.

Do not install smoke detectors in vehicle maintenance areas due to false alarm problems. Automatic fire detectors in these areas shall be heat detectors.

Ensure that sleeping room smoke detectors in barracks comply with the requirements of Military Handbook 1008C (10 June 1997), i.e., local alarm only, 120 V, powered from the building's power system. Do not put all detectors on the same circuit. This will cause all detectors downstream of an open circuit to be disabled.

Contractor shall provide a set of fire alarm schematic diagrams and O&M manuals in the electrical or mechanical room (wherever the control panel is located). Each zone shall be identified at fire alarm control panel.

Identify fire alarm zones by means of a diagram posted at the building entrance.

Provide a minimum of 2 days of training for the fire detection and alarm system.

Building designs which have a fire alarm system shall have an exterior strobe light alarm device mounted on the outside of the building on the street side. The strobe acts as a visual indication to the responding firemen. It decreases response time because the firemen don't have to waste time hunting for building numbers.

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Technical Requirements and Instructions

SECTION 13900
Fire Protection Systems

Ft. Campbell Requirements:

Special Requirements for Backflow preventers in sprinkler systems:

Do not use a strainer with the backflow preventer.

Provide a means to perform a full flow test of the backflow preventer. NFPA allows. Do not allow removal of the clappers from check valve and fire department connection for this purpose, however this is a nuisance. Provide a test valve for this purpose. Tee into the sprinkler system downstream of the backflow preventer. Route the discharge water outdoors.

Refer to [Section 15400](#) for general backflow preventer requirements.

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TECHNICAL DESIGN GUIDE
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15100	<u>Hydronic Piping</u>
15190	<u>Gas Piping</u>
15400	<u>Plumbing, General Use</u>
15550	<u>Water and Steam Heating</u>
15620	<u>Chillers</u>
15700	<u>Air-Conditioning System (Unitary Type)</u>
15702	<u>Computer Room Units</u>
15895	<u>Air Supply, Distribution, Ventilation and Exhaust System</u>
15940	<u>Vehicle Tailpipe Exhaust</u>
15951	<u>Direct Digital Control (DDC)</u>
15990	<u>Testing, Adjusting, and Balancing HVAC Systems</u>
15995	<u>Commissioning HVAC Systems</u>

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CHAPTER 3

Division 15000

Technical Requirements and Instructions

SECTION 15000
General

Ft. Campbell Requirements:

Building service areas (mechanical rooms, electric/telephone rooms, cooling towers, grease traps, etc.) shall be easily accessible by maintenance personnel directly from the exterior, and shall include vehicle accessibility (i.e., pavement for utility trucks, etc.).

Make valves, balancing equipment, switches, etc., easily accessible for adjusting and maintenance. Ensure adequate clearances are maintained to pull tubes, filters, etc. on a heat exchangers, boilers, HVAC coils, etc. Provide adequate space and clearances for maintenance of the equipment.

Make sure unions are located so that they can be turned with a wrench.

Do not install equipment on metal or sloping roof systems.

For each piece of equipment ask yourself how the maintenance technician will access the equipment for service, repair, and removal and replacement of heavy parts such as motors.

If a VAV system is used, the designer must carefully consider the mounting location of each VAV box. The VAV boxes must be easily accessible from a step ladder. They should be located so that moving furniture is not necessary. VAV boxes must not be located high above a suspended ceiling; this makes access nearly impossible. Designers must show the mounting height and insure access to all sides of the VAV boxes.

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Technical Requirements and Instructions

SECTION 15080
Insulation

Ft. Campbell Requirements:

Do not use all service jacket (ASJ) in humid or unconditioned spaces. The adhesive on this product does not hold in high humidity conditions.

Do not use fiberglass outdoors or anywhere insulation may get wet.

Provide metal or PVC covering over piping or equipment insulation in spaces that are not air conditioned (cooled); mechanical rooms and storage rooms are examples.

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Technical Requirements and Instructions

SECTION 15100 Hydronic Piping

Ft. Campbell Requirements:

Provide a location for injecting chemical inhibitors into the system.

Provide a location for pulling water samples.

Provide strainers to remove solids from system.

Avoid using glycol systems. If a glycol system must be used, provide a means to flush the system and show it on the drawings.

Avoid the use of Dual Temperature piping systems.

Install expansion tank valves and unions so the tank can be isolated from the system for maintenance. Valves are to be mechanically tied down so they cannot be inadvertently closed. Provide a drain line and valve connected to the piping between the isolation valve and the expansion tank for draining the expansion tank in order to check the air pre-charge.

Show the required air pre-charge pressure on the drawings.

Install valves and unions to isolate individual equipment. Install valves to isolate individual buildings on central systems servicing several buildings..

Size balance valves to have about 1 psi pressure drop wide open so that they will not operate nearly closed to achieve the necessary flow restriction in the system.

Specify gate valves or ball valves in lieu of butterfly valves.

Avoid valves that function as a combination check, balance, and isolation valve all in one. These triple duty type valves compromise each function. Provide separate valves. Remove triple duty type valves from the specifications.

Detail and specify vents at all trapped high points in the piping.

Detail and specify drains at all trapped low points in the piping.

Use dial type thermometers installed in thermowells.

Provide spare thermowells at each temperature sensor.

Use oil filled dial type pressure gauges.

Where domestic water is used for system make-up, use a reduced pressure backflow preventer in the make-up line.

Use separate backflow preventers on the make-up lines to the chilled water and the hot water systems. Otherwise cross flow between the systems can occur (even if check valves are used).

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SECTION 15190
Gas Piping

Ft. Campbell Requirements:

Gas lines shall not be used for electrical grounding.

Refer to [Appendix F](#) Utility Procedures for outside service lines.

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Technical Requirements and Instructions

SECTION 15400
Plumbing, General Use

Ft. Campbell Requirements:

Water lines and gas lines shall not be used for electrical grounding.

Water Supply:

- Testing – Conduct sterilization/flushing of new water lines. Perform bacteriological testing of new water lines. See [Ft. Campbell Water Distribution System](#).

Fixtures:

- Use of Delta and American Standard fixtures. Discuss with plumbing shop at Pre-design Meeting to obtain fixtures preferences.
- Faucet fixtures shall be metal and not plastic.

Drains:

- Be sure equipment drains are sized properly.
- No HVAC drain lines to oil/water separators.

Waste:

- Cast iron pipe is preferred under building slabs for waste lines due to its service life and durability. PVC will be considered by Fort Campbell for approval if adequate design information is provided by designer as to its strength and service life.

Grease Traps:

- Provide access (i.e. a way for a pumper truck to drive right up to the trap) for maintenance and periodic pump out.

Backflow Preventers:

Locate in a visible location with full access to the device for component removal and service no more than 4 feet above the floor.

Devices must be installed far enough away from walls and other equipment to allow service and repair (nominally 1 foot clearance on either side and 3 feet of clearance top and bottom) such that testing or repair can be performed without interference from adjacent equipment or building structure.

Reduced Pressure Backflow Preventor (RPBP) and Double Check Backflow Preventor (DCBP) devices should be equipped with test cocks.

Testable RPBP and DCBP devices should be equipped with strainers except in fire suppression systems.

All backflow devices must be installed horizontally unless the device is specifically designed for vertical installation.

RPBP relief valves must be vented to a drain of sufficient capacity to handle the full discharge flow of the relief valve.

Large RPBP devices (3"D or greater) are best vented to the outside unless a large floor drain with sufficient capacity is available.

Preferred devices include: Watts Regulator Inc., Zurn-Wilkins Inc., or Ames Corporation

RPBP devices must not be installed underground where they are susceptible to flooding. If an outdoor location is required, install the backflow preventer in an insulated box with a heat plate for freeze protection.

Point of Contact for backflow prevention is Gary Sewell in Environmental Division at 270-798-9588.

ALL personnel involved with "backflow devices" shall be Tennessee/Kentucky certified in backflow devices. Contractors shall be required to qualify as a licensed Tennessee/Kentucky "Master Plumbers" Contractor. PWBC personnel installing, maintaining, or inspecting will also need to obtain and maintain the Tennessee certification (Master Plumber is optional). Tennessee offers training at no cost at its training center in Murfreesboro several times a year. Initial training is 4 days, renewal training is 2 days.

Atmospheric Vacuum Breaker Devices (AVB) should be installed with no valves downstream. A minimum of 6 inches must be provided above all downstream piping and flood level rim of receptor (hose bib, sink faucet, etc.).

Consider parallel devices where shutdown for inspection and maintenance is not feasible.

Devices shall have individual serial numbers. Numbers are needed to track a device to ensure it is not relocated or another type of device is installed. This is verified on the annual inspections/testing.

The following are backflow applications and recommended devices:

Building Feed	RPBP	High Hazard
Building Bypass	RPBP	High Hazard
Boiler Make up water	RPBP	High Hazard

Chiller Make up Water	RPBP	High Hazard
Wash Water Systems	RPBP	High Hazard
Dynamometers	RPBP	High Hazard
Film Developers	RPBP	High Hazard
Fire Systems w/ chemicals	RPBP	High Hazard
Water Conditioners	RPBP	High Hazard
Chemical Feed Tanks	RPBP	High Hazard
Pump Seal Flush	RPBP	High Hazard
Sewage Plant Connections	RPBP	High Hazard
Compressor Cooling Water	RPBP	High Hazard
Building Feed	DCBP	Intermediate Hazard
Building Bypass	DCBP	Intermediate Hazard
Garbage Disposal	DCBP	Intermediate Hazard
Irrigation Systems	DCBP or PVB	Intermediate Hazard
Ice Machines	DCBP	Intermediate Hazard
Steam Cookers	DCBP	Intermediate Hazard
Drink Machines	DCBP	Intermediate Hazard
Dental Utility Boxes	DCBP	Intermediate Hazard
Mop Sink	AVB	Intermediate Hazard
Hose Bibs	AVB	Intermediate & Low Haz.
Laboratory Sinks	AVB	Intermediate Hazard
Dishwashers	AVB	Intermediate & Low Haz.
Kitchen Wash Sink	AVB	Intermediate Hazard
Abbreviation:	Type of Device:	
RPBP	Reduced Pressure Backflow Preventor	
DCBP	Double Check Backflow Preventor	
PVB	Pressure Vacuum Breaker	
AVB	Atmospheric Vacuum Breaker	

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Technical Requirements and Instructions

SECTION 15550
Water and Steam Heating

Ft. Campbell Requirements:

Environmental Air Quality requirements apply. See Appendix A, [Environmental Topics](#).

Install fire tube boilers in lieu of sectional boilers.

Install emergency boiler shutoff (push button) switches just inside mechanical room door.

In converters, use stainless steel converter tubes instead of copper.

Include manufacturer approved devices installed for testing samples of water and steam in the system (both in the mechanical room and at the ends of the system).

For Steam regulators, use Leslie regulator.

At the steam entrance into a building, install a double-block-and-bleed valve arrangement for positive isolation and venting of the steam during maintenance of the downstream system components.

For oil containing equipment, design a containment curb under the equipment.

Do not install equipment in pits.

Locate laminated copies of as-built drawings and control schematics in mechanical rooms.

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Division 15000 Technical Requirements and Instructions

SECTION 15620
Chillers

Ft. Campbell Requirements:

Locate equipment to minimize piping runs.

Do not install roof-top equipment on metal or sloping roof systems.

Where direct expansion units are employed, use only manufacturer standard sized package units.

Install only manufacturer standard sized package chillers.

On outdoor package chillers, provide a circulating pump and bypass to allow flow through the chiller during the heating season (trying to keep from draining the system).

Design for the chiller to have control of the pumps for chiller freeze protection.

Install strainers upstream of chiller barrels and condenser barrels.

Install a single pressure guage on the chiller barrel piped to read the inlet and outlet pressure.

Install a single pressure guage on the condenser barrel piped to read the inlet and outlet pressure.

Refer to Section 15951 Direct Digital Control for DDC for the points required to be monitored and controls from the Energy Monitoring and Control System. Specify that the chiller have the capability to communicate this data.

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Technical Requirements and Instructions

SECTION 15700
Air-Conditioning System (Unitary Type)

Ft. Campbell Requirements:

Do not install roof-top equipment on metal or sloping roof systems.

Locate equipment to minimize piping runs.

Use only manufacturer standard sized package.

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Technical Requirements and Instructions

SECTION 15702
Computer Room Units

Ft. Campbell Requirements:

Provide soft water for make-up.

Provide automatic blowdown for humidifiers.

Oversized computer room units are common. Determining the cooling load by summing all the nameplate amp ratings of all the computer equipment will surely result in an oversized unit and cause inefficient operation. Space humidity may not be a problem only because the computer room unit has reheat capability. The unit adds enough heat to make up for the excess in airflow. Size computer room units to accommodate the actual heat release from the computer equipment; airflows will be decreased, the supply temperatures will be lower for a longer period of time, and the reheat will operate far less frequently. Always consider multiple computer room units to split the cooling load; if one unit fails, the other can keep the space at a reasonable temperature.

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Technical Requirements and Instructions

SECTION 15895

Air supply, Distribution, Ventilation, and Exhaust System

Ft. Campbell Requirements:

Solvent cleaning in Arms Rooms - adequate ventilation a concern. Ventilate arms vaults at a rate of 0.1 CFM / Sq.Ft. minimum at all times. Provide separate manually operated ventilation at the rate of 0.5 CFM / Sq.Ft. during solvent cleaning.

Provide balancing dampers in all branch ducts feeding diffusers. Do not use volume dampers at diffusers for balancing because the noise created by a throttled damper at the diffuser is not attenuated.

Avoid over estimating cooling loads and cooling air flow to spaces. Doing so causes high space humidity, especially at part load cooling conditions. Refer to the appendix titled Mold and Humidity for air system considerations with regard to achieving good space humidity conditions.

Size cooling coils handling outdoor air for the design dry bulb temperature day, or the design humidity day which ever gives the greater coil capacity.

Provide dial type thermometers at air handlers to indicate the temperature of the supply air, return air, outdoor air, and mixed air.

Provide pressure gauges at air handlers to measure the supply duct pressure, the filter differential pressure, and the fan differential pressure.

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Technical Requirements and Instructions

SECTION 15940
Vehicle Tailpipe Exhaust

Ft. Campbell Requirements:

The designer must verify the type of vehicles being serviced. Large diesel engine driven vehicles can require an exhaust volume much higher than the typical 400 to 600 CFM vehicle exhaust system can handle.

Before sizing the exhaust system components, determine the engine displacement, the engine speed while being run on the exhaust system, whether or not the engine is turbocharged, and whether the engine is operated loaded or unloaded at high idle speed.

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Technical Requirements and Instructions

SECTION 15951
Direct Digital Controls (DDC)

Ft. Campbell Requirements:

General Requirements:

Provide system control schematic diagrams for each system indicating all required sensors, actuators.

Indicate the valve coefficient, C_v for each control valve.

Locate Freeze stats downstream of the heating coil and be sure manufacturer approved mounting is specified.

Electric actuators are to be oil immersed gear actuated or Belimo type. Do not use electro-hydraulic actuators.

Provide actuator position feedback to the DDC for monitoring the position of all valves and dampers.

Be sure conduit enters the control panel from the bottom only.

Specify that all wiring leaving the panel must be landed on a terminal strip separate from the control devices.

Provide control panel with hasp and pad lock in lieu of the panel lock. Pad lock shall be keyed same as the room door.

Do not use a personal computer (PC) as a router to convert from one protocol to another. PCs should be used as the interface to the system, not as a required component in the network.

Show the location of the control panels on the drawings.

Provide laminated control diagrams in the control panel.

EMCS Requirements on Bid Projects:

Include the following provisions in the specification, However do not include the notes to the designer in the specifications:

1.x Connection to the Energy Management and Control System (EMCS)

1.x.1 The Direct Digital Controls (DDC) system shall be connected to the existing Fort Campbell EMCS central workstations in buildings 865 and 3904. The existing EMCS is an Andover Continuum DDC system.

1.x.2 The connection shall provide monitoring and control of the building control system from the existing EMCS central workstations.

1.x.3 The connection to the EMCS shall provide the ability to do the following from the existing central workstations: monitor inputs, control outputs, revise equipment schedules, override schedules, set up trends, and receive alarms.

1.x.4 The connection shall use the existing post Ethernet network as the data transmission media.

1.x.5 The connection communication protocol shall be in strict conformance to the Building Automation and Control Network (BACnet®) Standard 135 published by the American Society of Heating Refrigerating and Air Conditioning Engineers (ASHRAE).

1.x.6 Additional hardware shall not be installed at building 865 or 3904.

1.x.7 Additional software shall not be installed on the existing EMCS workstations.

1.x.8 The contractor shall be responsible to complete the connection and system integration of the building controls to the existing EMCS including all required programming of the existing EMCS workstations. The point of contact for work on the existing EMCS (Andover Controls) workstation is Patrick Hamsley, Radco, phone 502 267-9636.

1.x.9 The control inputs and outputs, the schedules, and the alarms to be transmitted shall be as shown on the drawings.

Note to the Designer: On the drawings, in addition to the system control schematics, and sequences of operation, provide a table showing for each system indicating the inputs, outputs, trends, schedules and alarms to be available at the EMCS. Refer to the section below titled EMCS Points for the minimum required points to be made available at the EMCS.

1.x.10 A personal computer (PC) type workstation shall be provided at the building if specified or shown on the drawings for use as a local interface to the building controls.

1.x.11 A personal computer (PC) shall not be used as the building interface to the EMCS, nor shall a PC be used to convert protocol used by the building controllers to BACnet protocol.

1.x.12 Notify the Contracting Officer 4 weeks in advance of the building connection to the post Ethernet and coordinate with the Public Works Business Center (PWBC) point of contact for Information Technology (IT) issues. The PWBC contact is Tim Foe, phone 270-798-6716. PWBC will provide IP addresses, install anti-virus software on any building workstations, and coordinate with Fort Campbell Information Technology Business Center (ITBC) concerning the connection to the post Ethernet.

Note to the Designer: On the drawings, show the limit of work by the contractor for the EMCS connection. Generally, the Government (ITBC) will make the physical wiring connection using Category 5 cables between the new building controller and the Ethernet switch in the communications room. The contractor would then provide an empty conduit from the building controller cabinet to the communication closet or as directed by the Government (ITBC). Show two cables from the Ethernet switch in the Communications room to the building controller cabinet. One cable is for data communication to and from the EMCS, the other is for a communication port in the controller cabinet for connection of the portable service tool (laptop).

EMCS Requirements on Design / Build Projects:

Include the following words in the Request for Proposal (RFP) in the section dealing with building controls. However do not include the notes to the RFP author in the RFP:

The HVAC control system shall be a direct digital control (DDC) system meeting the requirements of and installed in accordance with [Unified Facility Guide Specification UFGS-15951 Direct Digital Controls][Specification Section 15951 Direct Digital Controls]. The equipment shall be limited to the options contained within the specification.

The DDC system shall be connected to the existing Fort Campbell Energy Monitoring and Control System (EMCS) central workstations in buildings 865 and 3904.

The existing EMCS is an Andover Continuum DDC system.

The connection shall provide monitoring and control of the building controls from the existing central workstations.

The connection shall provide the ability to do the following from the existing central workstations: monitor and control inputs and outputs, revise equipment schedules, override schedules, view trend data collected and stored at the building controllers, set up trends at the workstation, and receive alarms from the building controllers.

The connection shall use the existing post Ethernet network as the data transmission media.

The connection communication protocol shall be in strict conformance to the Building Automation and Control Network (BACnet) Standard 135 published by the American Society of Heating Refrigerating and Air Conditioning Engineers (ASHRAE).

Additional hardware shall not be installed at building 865 or 3904.

Additional software shall not be installed on the existing EMCS workstations.

The contractor shall be responsible to complete the connection and system integration of the building controls to the existing EMCS including all required programming of the building controls and the existing EMCS workstations.

The point of contact for work on the existing EMCS (Andover Controls) workstation is Patrick Hamsley, Radco, phone 502-267-9636.

The control inputs and outputs, the schedules, and the alarms to be transmitted shall be as indicated in this scope of work.

Note to the RFP author: Include a list or table showing typical inputs, outputs, schedules, and alarms to be transmitted to the EMCS, and trends to be maintained by the building controls and available to the EMCS. Include the position of all damper and valve actuators as an input available at the EMCS. Refer to the section below titled EMCS Points for the minimum required points to be made available at the EMCS.

[A desktop personal computer (PC) type workstation shall be provided at the building for use as a local interface to the building controls.]

Note to the RFP author: Include the above requirement if the building occupants want a local interface to the controls. This will rarely be the case.

A personal computer (PC) shall not be used to interface the building controls to the EMCS network, nor shall it be used to convert protocol used by the building controllers to BACnet protocol.

Note to the RFP author: A PC is considered to be an unreliable means of providing router functions and can not be located in the mechanical room because of the dust, humidity, and temperature.

A portable workstation / tester (lap top type computer) shall be provided with controls set up and diagnostic software installed. This device shall serve as a tool for the maintenance staff to access and modify the controls configuration.

Notify the Contracting Officer 4 weeks in advance of the building connection to the post Ethernet and coordinate with the Public Works Business Center (PWBC) point of contact for Information Technology. The PWBC contact is Tim Foe, phone 270-798-6716. PWBC will provide IP addresses, install anti-virus software on [any building workstations and on] the portable workstation / tester service tool and coordinate with Fort Campbell Information Technology Business Center (ITBC) concerning the connection to the post Ethernet and opening the communication port.

Note to the RFP author: Delete the bracketed words if a PC for local interface to the controls is not provided.

The Government (ITBC) will make the physical connection between the new building controller and the Ethernet switch in the communications room. The contractor shall provide an empty conduit from the building controller cabinet to the communication closet.

Note to the RFP author: Contact ITBC to confirm that they will perform the work described or modify the above provisions in accordance with discussions with ITBC.

EMCS Requirements on All Projects - EMCS Points:

Inputs and outputs (points) to be connected to the Energy Monitoring and Control System are given below. The designer or author of the RFP should be sure that the procurement documents require that these points are available at the EMCS as a minimum.

Abbreviations that may be used in this section are as follows:

AI – analog input
AO – analog output
CSR – current sensing relay
DI – digital input
DO – digital output
dP – differential pressure
EMCS - Energy Monitoring and Control System
HVAC - Heating Ventilating and Air Conditioning
KW - Kilowatt
LAN – local area network
MZ – Multizone
SZ – Single Zone
VAV – Variable Air Volume

Ethernet Hub and Communication Cable

Verify that there will be an Ethernet hub within the building. This serves as the connection to the EMCS. A communication line will need to be extended to the mechanical room for connection of the gateway or router. If discussion with Fort Campbell ITBC is required, call Phil Butler at (270) 798-9654. This information will be included on the building plans.

Points

New instrumentation and controls such as sensors, control relays, and status indication will be connected to the EMCS. The following is a recommended summary of the minimum EMCS points to connect. Some of the listed equipment may not be used on this project. Some equipment may be missing. However, this list should give a feel for the types of points to connect. Note that some of the points such as damper or valve actuator position may not be needed by the building controls. Such points would be monitoring points.

Air Handler Units - Single Zone, VAV, and Multizone

Digital Outputs:

Start / Stop signal

Vent Delay signal. This is used to disable the outdoor air damper during morning warm up (or cool down) before the building occupants arrive. It is not required if the local controls are taking care of this function.

Analog Outputs: None

Digital Inputs:

Fan on / off status via dP switch is the preferred method. CSR is second preference.

Differential pressure switch across filters.

Economizer status.

Freezestat status.

Duct Smoke detector status.

Analog Inputs:

Supply air temperature.

Hot deck temperature for MZ units.

Cold deck temperature for MZ units.

Return air temperature.

Mixed air temperature. Add the sensor if it is not part of the normal controls.

Damper positions.

Valve positions.

Space temperature.

Space humidity where sensors are installed for humidity control.

OA temperature sensors will not be added or connected. OA temperature is currently monitored by the EMCS at a central location.

Alarms:

AHU fan failure to start

AHU fan failure to stop

Return Temperature High

Return Temperature Low

Space Temperature High

Space Temperature Low

Mixed Air Temperature Low

Freezestat Trip

Smoke condition

Trend: Data is stored at the building controller

Space temperature

Space humidity

Supply Air Temperature

VAV Boxes (applies to normal pressure independent VAV boxes)

Digital Outputs: None

Analog Outputs:

Space temperature setpoint adjustment.

Digital Inputs:

Fan Status, if the box is fan powered.

Analog Inputs:

Space Temperature

Air Flow through the primary air damper

Damper position

Valve position

Alarms: None

Trend: None

Hot Water Boiler

Digital Outputs:

Control Relay to disable the boiler.

Analog Outputs: None.

Digital Inputs:

Boiler (burner) status will be included.

Analog Inputs:

Hot water supply temperature to the building.

Hot water return temperature from the building.

Alarms:

Boiler trouble alarm from ignition controls

Hot leaving temperature high

Hot leaving temperature low

Trend: Data is stored at the building controller

Hot water supply temperature

Hot water return temperature

Steam to Hot Water Converter

Digital Outputs:

Control Relay to disable the steam valve.

Analog Outputs: None.

Digital Inputs: None.

Analog Inputs:

Converter entering water temperature.

Converter leaving water temperature.

Alarms:

Hot leaving temperature high

Hot leaving temperature low

Trend: Data is stored at the building controller

Hot water supply temperature

Hot water return temperature

Chillers

Digital Outputs:

Enable / Disable Signal.

Analog Outputs:

Chilled water setpoint adjustment.

Digital Inputs:

On / Off Status.

Chiller failure alarm: This is to indicate when there is a local chiller alarm. The specific condition causing the alarm need not be transmitted. The goal is to know when the chiller is in need of service.

Analog Inputs:

Chilled water supply temperature from the chiller to the building.

Chilled water return temperature from the building to the chiller.

Condenser water inlet temperature.

Condenser water outlet temperature.

Alarms:

Chiller failure signal from chiller packaged controls

Failure to stop after Disable command

Trend: Data is stored at the building controller
Chilled water supply temperature

Chilled water return temperature

Condensing Units

Digital Outputs:

Enable / Disable Signal. The signal serves to override the local automatic controls to force the condensing unit to stop.

Analog Outputs: None.

Digital Inputs:

On / Off Status via a CSR or interface to the on-board controls.

Analog Inputs: None.

Alarms:

Failure to stop after Disable command

Trend: None

Pumps

Digital Outputs:

Enable / Disable signal to override the local motor controls and force the pump to stop even if the motor starter is in the HAND position.

Analog Outputs: None.

Digital Inputs:

Pump on / off status; by a dP switch or by CSR.

Analog Inputs: None.

Alarms:

Failure to start.

Failure to stop.

Trend: None

Occupied Space

Digital Outputs: None

Analog Outputs: None.

Digital Inputs: None.

Analog Inputs:

Space temperature. Use VAV box sensors where possible. Use space sensors included for the control of air handlers where possible. In this case the space temperature may be shown as a point associated with the air handler. Additional space sensors may be added if necessary.

Alarms:

Space temperature high

Space temperature low

Trend: Data is stored at the building controller

Space temperature

Computer Room Units (such as Liebert units)

Digital Outputs: None.

Analog Outputs: None.

Digital Inputs: None.

Analog Inputs: None.

Alarms:

Trouble or failure signal from the packaged controls.

Trend: None

Make-up Air Units

As a rule, there is no EMCS control of the process exhaust equipment such as kitchen hoods. Likewise there will be no EMCS control of the associated make up air equipment serving kitchen hoods. However, where space sensors in the areas served by the make up air units are connected to the DDC, these will be included and connected to the EMCS.

Digital Outputs: None

Analog Outputs: None.

Digital Inputs:

On / Off Status.

Analog Inputs:

Space Temperature where this sensor is interfaced to the DDC.

Trend: None

Infrared Gas Heaters

Digital Outputs: None.

Analog Outputs: None.

Digital Inputs: None

Analog Inputs:
Space Temperature.

Alarms: None

Trend: None

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CHAPTER 3

Division 15000

Technical Requirements and Instructions

SECTION 15990

Testing, Adjusting, and Balancing (TAB) HVAC Systems

Ft. Campbell Requirements:

Require the TAB technician to measure, balance, and report the building pressure relative to atmosphere.

Where VAV systems are employed, require measurement of the building pressure at full air flow and at minimum air flow.

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CHAPTER 3

Division 15000

Technical Requirements and Instructions

SECTION 15995
Commissioning of HVAC Systems

Ft. Campbell Requirements:

All projects, MILCON and OMA and other funding sources, shall be executed using commissioning procedures and processes per the COE specification.

Any special tools, computers, software, etc., required for operations and maintenance of the new equipment that will assist maintenance personnel maintain the facility shall be turned over to the contracting officer.

Specify training for PWBC personnel. Training shall be given by factory authorized personnel.

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CHAPTER 3

Division 16000

Technical Requirements and Instructions

SECTION 16370
Electrical Distribution System, Aerial

Ft. Campbell Requirements:

No electric equipment shall be installed within or on any Fort Campbell building, structure, or premises, nor shall any alteration or addition be made in any such existing equipment without first securing an Electrical Permit (FC Form 4183) from the Fort Campbell Electrical Inspector in accordance with Fort Campbell Public Works Business Center Standing Operating Procedure (SOP) 308, except as provided within said SOP. Copies of SOP and permits shall be obtained at PWBC, Operations and Maintenance Division, Building 867, 16th Street, Fort Campbell, Kentucky.

The distribution level voltage at Fort Campbell is 12.47/7.2 kV.

All new electrical distribution lines shall be installed underground, see Section 16375. If and when overhead service has been approved by the installation, use pinless construction. Should a need for cross arms arise, use fiberglass. Wooden poles with wooden cross arms are NOT to be utilized.

Where distribution lines must be installed overhead:

- * Use wooden poles with 20 year life span.
- * Use armless, narrow profile construction where practicable.
- * Use fiberglass crossarms where crossarms are required.
- * Overhead lines shall be ACSR (no copper).
- * All fittings shall be compression type.
- * All equipment mounts shall be aluminum.
- * All overhead switches and cut-outs shall be of the loadbreak type.

Minimize distribution lines installed under pavement.

Generally, when underground electric approaches 350-400 feet in length, provide a manhole.

Underground medium voltage lines shall be concrete encased. Underground service entrance conductors shall be copper installed in conduits. Copper conductors are preferred for overhead service drops, but aluminum conductors are acceptable. However provide copper conductors from meter base to service equipment inside. If meter or disconnect mounted on a pole, run copper conductors from transformer down.

Distribution lines shall be designed for maximum system flexibility. Use loop feed where practicable to create redundancy. In housing areas utilizing underground distribution, run separate feeds from transformer to each apartment.

The following guidance applies to all electrical distribution equipment that contains oil. This is for equipment installed permanently as well as temporary installation for contractor's offices at a job site or in contractor's row next to Roads & Grounds.

- Delta banks shall not be provided for transformer stations.
- Provide adjustable taps on transformers.
- Rebuilt or reconditioned transformers will be not installed.
- A nameplate will be provided on all transformers that says "NON-PCB" or "LESS THAN 1 PPM PCB". In addition to the nameplate PCB-free designation, all transformers will have a "No PCB's" per EPA regulations. Stickers shall be visible from the ground. The sticker shall be 2" wide by 1" high, UV fade resistant, pressure sensitive adhesive backing, blue background with white letters, and suitable for all weather conditions. Source of supply is Style PCNL as manufactured by Labelmaster Hazardous Materials Safety Products, 1996 General Catalog G-110.
- The following information will be provided to the construction representative to be forwarded to the Environmental Division point of contact Wally Crow for updating of the Fort Campbell database:

Manufacturer:
Model Number:
Serial Number
Manufacture Date:
KVA and Phase:
Primary Voltage:
Secondary Voltage:
Installation Date:
State Installed:
Location Installed:

Any new oil equipment used shall be non-PCB. All regulated electrical equipment at Fort Campbell should be free of PCB. However, if a contractor should discover a piece of

equipment that is not marked, the PWBC Environmental Division should be contacted. The POC for PCB is Russ Godsave.

Instructions to Designers:

1. Include all required features and specific equipment features into project design and contract documents specifications as they apply.

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CHAPTER 3

Division 16000

Technical Requirements and Instructions

SECTION 16375
Electrical Distribution System, Underground

Ft. Campbell Requirements:

No electric equipment shall be installed within or on any Fort Campbell building, structure, or premises, nor shall any alteration or addition be made in any such existing equipment without first securing an Electrical Permit (FC Form 4183) from the Fort Campbell Electrical Inspector in accordance with Fort Campbell Public Works Business Center Standing Operating Procedure (SOP) 308, except as provided within said SOP. Copies of SOP and permits shall be obtained at PWBC, Operations and Maintenance Division, Building 867, 16th Street, Fort Campbell, Kentucky.

The distribution level voltage at Fort Campbell is 12.47/7.2 kV.

All new electrical distribution lines shall be installed underground. If and when overhead service has been approved by the installation, use pinless construction. Should a need for cross arms arise, use fiberglass. Wooden poles with wooden cross arms are NOT to be utilized.

Minimize distribution lines installed under pavement.

Generally, when underground electric approaches 350-400 feet in length, provide a manhole.

Underground medium voltage lines shall be concrete encased. Underground service entrance conductors shall be copper installed in conduits. Copper conductors are preferred for overhead service drops, but aluminum conductors are acceptable. However provide copper conductors from meter base to service equipment inside. If meter or disconnect mounted on a pole, run copper conductors from transformer down.

Distribution lines shall be designed for maximum system flexibility. Use loop feed where practicable to create redundancy. In housing areas utilizing underground distribution, run separate feeds from transformer to each apartment.

At design meetings, discuss what outages will be needed and for how long. Generally, Ft. Campbell will allow a 4-8 hour utility outage if the utility is not a critical customer

need and is properly coordinated and public notification is made to impacted customers. Outages shall be limited to not more than 3-4 to a customer for the contract duration. For a major outage, Ft. Campbell would advertise for at least 2 weeks prior to outage occurrence.

Fort Campbell has a great deal of underground utility lines (both active and abandoned) that do not show up on Base utility maps. Therefore, any utilities to be installed underground must be coordinated with PWBC as soon as possible during the design process.

Utility lines installed underground shall be marked with magnetic tape.

Grounding shall not be accomplished at water lines. Use of ground rods is required.

Provide individual meters on gas, water, and electric service lines for all buildings. Meters shall be capable of receiving a device which will allow remote monitoring in the future.

Trenching through roadways shall be avoided to the maximum extent possible. Whenever possible utilities shall be pressure-pumped below roadways. When underground utilities are sleeved under roadways, conduit sleeves shall be extended a minimum of 10 feet beyond the roadway on both sides to protect conductors from penetration by new road signs, poles, etc.

The following guidance applies to all electrical distribution equipment that contains oil. This is for equipment installed permanently as well as temporary installation for contractor's offices at a job site or in contractor's row next to Roads & Grounds.

- Service transformers, for all 15kV, and below, 3-phase underground fed installations, shall be of the pad-mounted type. The high-voltage compartment shall be dead-front construction. Primary switching and protective devices shall include loadbreak switching, fuse protection, medium-voltage separable loadbreak connectors, universal bushing wells and inserts or integral one piece bushings and surge arresters. The nameplate rating for the transformer shall not be less than 90 percent of the KVA demand load calculated for the transformer. Provide copper windings, not aluminum. Enclosure shall be lockable using a padlock. New single phase transformer installations shall utilize a pad mount transformer. Single phase installations for O&M projects shall be coordinated with user as to whether a pole mount or a pad mount transformer should be used. Designer shall coordinate with the PWBC as to whether a new or replacement feed is to be run aerially or underground.
- Delta banks shall not be provided for transformer stations.
- Provide adjustable taps on transformers.
- Rebuilt or reconditioned transformers will be not installed.

- A nameplate will be provided on all transformers that says "NON-PCB" or "LESS THAN 1 PPM PCB". In addition to the nameplate PCB-free designation, all transformers will have a "No PCB's" per EPA regulations. Stickers shall be visible from the ground. The sticker shall be 2" wide by 1" high, UV fade resistant, pressure sensitive adhesive backing, blue background with white letters, and suitable for all weather conditions. Source of supply is Style PCNL as manufactured by Labelmaster Hazardous Materials Safety Products, 1996 General Catalog G-110.
- The following information will be provided to the construction representative to be forwarded to the Environmental Division point of contact Wally Crow for updating of the Fort Campbell database:

Manufacturer:
Model Number:
Serial Number
Manufacture Date:
KVA and Phase:
Primary Voltage:
Secondary Voltage:
Installation Date:
State Installed:
Location Installed:

- Any new oil equipment used shall be non-PCB. All regulated electrical equipment at Fort Campbell should be free of PCB. However, if a contractor should discover a piece of equipment that is not marked, the PWBC Environmental Division should be contacted. The POC for PCB is Russ Godsave.

Instructions to Designers:

1. Include all features into project design and contract documents specifications as they apply.

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CHAPTER 3

Division 16000

Technical Requirements and Instructions

SECTION 16415
Electrical Work, Interior

Ft. Campbell Requirements:

No electric equipment shall be installed within or on any Fort Campbell building, structure, or premises, nor shall any alteration or addition be made in any such existing equipment without first securing an Electrical Permit (FC Form 4183) from the Fort Campbell Electrical Inspector in accordance with Fort Campbell Public Works Business Center Standing Operating Procedure (SOP) 308, except as provided within said SOP. Copies of SOP and permits shall be obtained at PWBC, Operations and Maintenance Division, Building 867, 16th Street, Fort Campbell, Kentucky.

Grounding shall not be accomplished at water lines. Use of ground rods is required.

Provide watt-hour meters and secondary surge arrestors on each new facility. Meters shall be capable of receiving a device to allow future remote monitoring

General:

There shall be an electrical room separate from the mechanical room to protect electrical communications and fire alarm equipment from temperature and humidity normally encountered in a mechanical room. Access to the electrical room shall be either directly from the outside of the building or through the mechanical room.

Do not use wet cell batteries, particularly for exit lights and emergency lights.

Coordinate with mechanical and plumbing disciplines to ensure that proper NEC clearances are maintained around electrical equipment in electrical and mechanical rooms.

Install surface mounted panelboards in unfinished areas of buildings. Install flush or semi-flush panelboards in other areas. Provide spare 1P circuit breakers and spaces for future expansion.

Coordinate plans so that lighting fixtures, smoke detectors, supply and return grilles, and other ceiling mounted equipment do not overlap or interfere with each other.

Do not install timers to control lighting in latrines and showers.

State in the contract that when systems or equipment require special tools or peripheral equipment to repair, operate, maintain, or program that tool or equipment shall be provided to the PWBC. This includes laptop computers and/or software. This applies in particular to fire alarm equipment and fiber optic systems. Also state in the contract that the contractor shall provide and schedule appropriate training for PWBC personnel to maintain unusual systems and equipment.

Provide reduced voltage starting where motor starting kVA will result in more than a 30% transient voltage dip per DA technical guidance (Technical Manual 5-811-2).

Use 3 phase motors to the maximum extent possible especially for integral (1/2, 3/4 HP) motors that start and stop frequently. (i.e. pumps and air compressors. General rule is less than 1 HP is single phase but single phase motors that start/stop frequently tend to wear out faster).

Provide single-phase protection on all 3-phase motors.

The following guidance applies to all electrical distribution equipment that contains oil. This is for equipment installed permanently as well as temporary installation for contractor's offices at a job site or in contractor's row next to Roads & Grounds.

- Rebuilt or reconditioned transformers will be not installed.
- Delta banks shall not be provided for transformer stations.
- Provide adjustable taps on transformers.
- A nameplate will be provided on all transformers that says "NON-PCB" or "LESS THAN 1 PPM PCB". In addition to the nameplate PCB-free designation, all transformers will have a "No PCB's" per EPA regulations. Stickers shall be visible from the ground. The sticker shall be 2" wide by 1" high, UV fade resistant, pressure sensitive adhesive backing, blue background with white letters, and suitable for all weather conditions. Source of supply is Style PCNL as manufactured by Labelmaster Hazardous Materials Safety Products, 1996 General Catalog G-110.
- The following information will be provided to the construction representative to be forwarded to the Environmental Division point of contact Wally Crow for updating of the Fort Campbell database:

Manufacturer:
Model Number:
Serial Number
Manufacture Date:
KVA and Phase:
Primary Voltage:
Secondary Voltage:
Installation Date:

State Installed:
Location Installed:

Any new oil equipment used shall be non-PCB. All regulated electrical equipment at Fort Campbell should be free of PCB. However, if a contractor should discover a piece of equipment that is not marked, the PWBC Environmental Division should be contacted. The POC for PCB is Russ Godsave.

Instructions to Designers:

1. Include all features into project design and contract documents specifications as they apply.

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CHAPTER 3

Division 16000

Technical Requirements and Instructions

SECTION 16528 Exterior Lighting Including Security

Ft. Campbell Requirements:

No electric equipment shall be installed within or on any Fort Campbell building, structure, or premises, nor shall any alteration or addition be made in any such existing equipment without first securing an Electrical Permit (FC Form 4183) from the Fort Campbell Electrical Inspector in accordance with Fort Campbell Public Works Business Center Standing Operating Procedure (SOP) 308, except as provided within said SOP. Copies of SOP and permits shall be obtained at PWBC, Operations and Maintenance Division, Building 867, 16th Street, Fort Campbell, Kentucky.

All exterior lighting (parking lot, street, building, etc.) shall be either 120, 208, or 277 Volt. 480-Volt lighting is not permitted. Safety is an issue when working on this high of a voltage, especially in inclement weather.

Exterior lighting (parking lot, street, building, etc) shall be Metal Halide or 100, 150, or 400 watt Mercury Vapor. Use 1500-watt metal halide on athletic fields. No High-Pressure Sodium lighting will be permitted.

All exterior street and flood lights, which are to be installed within a mile of the CAAF or SABRE airfield boundaries shall have controlled light distribution in the direction thereof and shall be provided with visors as required such that that angle of the beam, when extended, ends a minimum of 300 feet before the area of the affected airfield. The intent is to minimize light pollution in the area and to minimize the chances of pilots looking directly into the beams of nearby lights.

Parking lot lighting control shall be by photocell. Timers will not be permitted. This control shall be by means of one photocell per fixture or one photocell per pole. One photocell per pole is acceptable except for sensitive areas like hospitals, PX, and schools (all lights are out if photocell fails). Provide one photocell per fixture in those areas. Direct burial is acceptable for street light circuits.

Parking lot lighting fixtures shall be COE standard type EH1 and as indicated above.

Instructions to Designer

1. Include all features into project design and contract documents specifications as they apply.

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CHAPTER 3

Division 16000

Technical Requirements and Instructions

SECTION 16264 - 5 Standby Generator Sets

Ft. Campbell Requirements:

General Requirements:

- All Emergency Standby Generator sets shall employ Diesel Engines using DF 2 fuel and the engine speed shall be 1800 RPMs with manufacturer recommended over-speed protections. No LP, Natural Gas or Gasoline prime movers shall be approved for any reason.
- All Emergency Standby Generator sets shall be sized to the service of the main breaker/fuse.
- All Emergency Standby Generator sets shall service the entire facility; no partial coverage of a facility shall be permitted.
- Engines shall be radiator and fan cooled, and shall not be naturally aspirated.
- All emergency/standby generator sets shall conform to NFPA 110 either Level 1 or Level 2 Standards and installation quality.
- All emergency/standby generator sets shall be 1 step load increase to 100% of Service Load.
- Each generator shall start and assume 100% load within 10 seconds.
- Specifications requirements shall include obtaining all local and state (Kentucky or Tennessee) permits prior to beginning construction. Local permits shall include demolition, digging, excavation, compaction, electrical, fuel tank installation, and environmental. All submittals, site locations, load analysis and designs shall be approved by the Local Authority Having Jurisdiction to include but not limited to the Generator Mechanic for Public Works Business Center.

Site Requirements:

- A. Location:
- The Generator Set shall be located a minimum of 10 feet from any building or structure.
 - The Generator Set shall be located a minimum of 30 feet from any overhead power lines or transformer banks unless otherwise directed.
 - The Generator Set shall have a minimum of 5 feet clearance on all sides to facilitate maintenance.

- The Generator Set shall be a minimum of 5 feet from any type of vehicular traffic to include but not limited to streets, parking lots, alleys, or access roads and activities including mowing equipment.
- The Generator Set exhaust stack shall be a minimum of 10 feet from any building or structure to include any protrusions such as an overhangs, eaves, landscaping, etc., and it shall point away from any air conditioning or other air intake systems.
- The Generator Set shall have adequate access and ample room to be refueled using a standard refueling truck.
- Exterior located Generator Sets shall be placed on monolithically pour concrete foundation with stem walls. IAW CFR 40, section 112, a secondarily contained, monolithically poured pad shall be sized to hold 110% capacity of the fuel to be stored. The pad shall be slope to allow drainage thru a 4-inch PVC valve located in the corner of the lowest point of the pad, to include a 5-inch minimum thickness broom finish concrete rectangular pad. The pad shall extend a minimum 4-feet beyond the generator set in all directions. The concrete pad area shall be expanded as required to include associated electrical switch enclosures. Provisions for stub-up of electrical conduits shall be integral to design a construction of concrete base pad construction.
- See additional requirements for DAY TANKS.

B. Protection:

- The Generator Set shall have collision bollards placed around the generator pad. Each bollard shall be 6-inch diameter std. weight steel pipe 8 feet long.
- The bollard shall be installed in a 24-inch hole, 4 feet deep, and filled with concrete to include filling the bollard. The bollard shall then be painted caution yellow when finished.
- Bollards shall be placed 5 feet from the pad to prevent any vehicular damage to the generator set. One bollard will be placed at each corner of the generator base pad at a distance of 5 feet. The distance between any two bollards shall not exceed 6 feet. An average size generator set uses 10 bollards. The Local Authority having Jurisdiction will determine the location of each bollard when exceptions are necessary.
- See additional requirements for DAY TANKS.

Generator Set Requirements:

- All emergency/standby generators shall be mounted on spring isolators and flexible connections rated for seismic Zone C.
- The generator main circuit breaker: shall be set mounted and wired, UL listed, molded case thermal magnetic type. Each breaker shall be Shunt-Trip and wired to the engine fault conditions. Field circuit breakers shall not be acceptable for generator over current protections.

(Continued)

Day Tank Requirements:

- Sub-base (in skid/belly) fuel tanks will not be acceptable unless specifically specified and or approved by the Local Authority Having Jurisdiction to include but not limited to the Generator Mechanic for Public Works Business Center.
- All day tanks shall be capable of holding manufacturer recommended tank size for 2-hour 100% continuous load run. For smaller installations not less than 25-gallon day tank fuel storage capacity will be specified.
- All main/day tanks shall be above ground double walled permanently mounted to the floor or exterior concrete pad or they shall be concrete encased vaulted (equal to or greater than CONVAULT Type).
- When the day tank is located outdoors, it shall have an Outdoor Weather Protective Housing installed. (If Required)
- Emergency Standby Generator Sets installed inside of a structure shall have a day tank installed as part of the package.
- Each above ground fuel tank shall be at the minimum distance of 10 feet from any structure, overhang, property line, parking lot, or roadway.
- Each above ground fuel tank shall have 6-inch standard weight steel pipe concrete filled bollards placed around it to prevent accidental collision or impact from vehicles and or mowers. These bollards shall be primed and painted to prevent corrosion. The color shall be yellow.
- All fuel lines, (supply and return), shall be of black steel, non-wielded (threaded) construction. The fuel lines shall not rest on grade. They shall be mounted at the minimum height of at least 6 inches above grade. The fuel lines shall be separated at the minimum distance of 6 inches. The supply fuel line shall be $\frac{1}{2}$ ID, and the return fuel line shall be $\frac{3}{4}$ ID unless larger is manufacturer recommended. All fuel lines will have a vinyl or metal protective covering.
- All fuel lines will be insulated and have heat trace installed to prevent gelling of the fuel.
- Each day tank shall include a spin on canister type fuel filter to prevent contamination of the fuel supply.
- Each main fuel tank shall be equipped with an Anti-siphon valve.
- Each tank shall have a manual ball type shut off valve installed as close as possible to the Anti-siphon valve. No check valves shall be used in either the supply or the return fuel lines.
- Operation:
 - Each day tank shall use 120 VAC, 60 Hz electrical power. Each day tank shall have a supply pump capable of delivering fuel at the rated capacity of 2-gpm rate. It shall have a second pump capable of returning excess due to an overflow condition to the AST at the rated delivery of 3-gpm. Automatic operation. At 50% of fuel, the supply pump will energize and pump fuel from the AST back into the day tank. At 90% fuel level, the supply pump will de-energize.
 - Manual operation. The day tank shall be equipped with a manual operation switch to allow the operator to manually energize the supply pump.
 - Electronic 120 VAC fuel shutoff solenoid valve shall be installed down stream of the supply fuel pump. It shall be connected as to energize open when the supply pump is energized, and de-energized with the supply pump is de-energized.

- Over-flow activation float switch, shall be automatically activated if the fuel level in the day tank exceeds 95% fuel level. The return fuel shall then be pumped back into the AST.
- Controls and Functions:
 - The day tank control panel shall have the following minimum indications:
 Fuel Level
 Fuel Pump Status

Automatic Transfer Switch (ATS):

- Each ATS shall be of the standard type unless otherwise specified to be an Isolation Bypass type ATS. Equipment shall be a standard product of a manufacturer regularly engaged in manufacturing the products whose applications are similar to the required design and rating of ATS equipment. Equipment shall be capable of being serviced by a manufacturer authorized and trained organization that is reasonably convenient to the site.
 - Each ATS shall have a fusible disconnect or circuit breaker upstream of the ATS or unless otherwise specifically stated that the ATS shall be a Service Entrance Rated ATS.
 - Each ATS shall have an automatic exerciser installed to be able to program the generator set and the ATS to exercise once a week with or without a load.

Instructions to Designers:

1. All project generator set guide specifications shall be revised to include the following mark-up: [Specification 16264-5, Design Specification for Emergency Standby Generators](#).
2. Include all above listed features and specific equipment requirements into project design and contract document drawings and specifications as they apply.
3. The Local Authority having Jurisdiction shall approve all designs, drawings and specifications before bid issue of such projects. This is to insure that once the Generator systems has been inspected and accepted by the appropriate people, it will meet all codes, regulations, and SOPs of Fort Campbell and the state of Kentucky or Tennessee. Once it has been accepted, it becomes Real Property, and P.W.B.C. will be responsible to maintain it. As of this time, Nick Overstake, P.W.B.C. Electric shop is the Local Authority having Jurisdiction on all Generators, Deluge Pumps, and above ground Fuel Systems on Fort Campbell. He can be reached at 270-956-2853 or on his cell phone 931-216-6682.

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Note To Designer: Contents of this DRAFT specification shall be reviewed and incorporated into the project specifications.

DIESEL-GENERATOR SET, STATIONARY 15-300 KW, STANDBY APPLICATIONS
06/03

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C12.11 (1987; R 1993) Instrument Transformers for Revenue Metering, 10 kV BIL through 350 kV BIL (0.6 kV NSV through 69 kV NSV)

ANSI C39.1 (1981; R 1992) Requirements for Electrical Analog Indicating Instruments

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 53/A 53M (1999b) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

ASTM A 106 (1999e1) Seamless Carbon Steel Pipe for High-Temperature Service

ASTM A 135 (1997c) Electric-Resistance-Welded Steel Pipe

ASTM A 181/A 181M (2000) Carbon Steel Forgings for General-Purpose Piping

ASTM A 234/A 234M (2000) Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service

ASTM B 395 (1995) U-Bend Seamless Copper and Copper Alloy Heat Exchanger and Condenser Tubes

ASTM B 395M (1995) U-Bend Seamless Copper and Copper Alloy Heat Exchanger and Condenser Tubes (Metric)

ASTM D 975 (1998b) Diesel Fuel Oils

ASME INTERNATIONAL (ASME)

ASME B16.3 (1998) Malleable Iron Threaded Fittings

ASME B16.5 (1996; B16.5a) Pipe Flanges and Flanged Fittings NPS 1/2 thru NPS 24

ASME B16.11 (1996) Forged Fittings, Socket-Welding and Threaded

ASME B31.1 (1998) Power Piping

ASME BPVC SEC VIII D1 (1998) Boiler and Pressure Vessel Code; Section VIII, Pressure Vessels Division 1 - Basic Coverage

ASME BPVC SEC IX (1998) Boiler and Pressure Vessel Code; Section IX, Welding and Brazing Qualifications

ASSOCIATION OF EDISON ILLUMINATING COMPANIES (AEIC)

AEIC CS5 (1994; CS5a-1995) Cross-Linked Polyethylene Insulated Shielded Power Cables Rated 5 Through 46 kV

AEIC CS6 (1996) Ethylene Propylene Rubber Insulated Shielded Power Cables Rated 5 Through 69 kV

ELECTRICAL GENERATING SYSTEMS ASSOCIATION (EGSA)

EGSA 101P (1995a) Engine Driven Generator Sets

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)
IEEE C2 (1997) National Electrical Safety Code

IEEE Std 1 (1986; R 1992) General Principles for Temperature Limits in the Rating of Electric Equipment and for the Evaluation of Electrical Insulation

IEEE Std 48 (1998) Standard Test Procedures and Requirements for Alternating-Current

Cable Terminations 2.5 kV through 765 kV

IEEE Std 81 (1983) Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System (Part 1)

IEEE Std 100 (1997) IEEE Standard Dictionary of Electrical and Electronics Terms

IEEE Std 120 (1989) Electrical Measurements in Power Circuits

IEEE Std 404 (1993) Cable Joints for Use with Extruded Dielectric Cable Rated 5000 V Through 138 000 V and Cable Joints for Use with Laminated Dielectric Cable Rated 2500 V Through 500 000 V

IEEE Std 519 (1992) Harmonic Control in Electrical Power Systems

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-58 (1993) Pipe Hangers and Supports - Materials, Design and Manufacture

MSS SP-69 (1996) Pipe Hangers and Supports - Selection and Application

MSS SP-80 (1997) Bronze Gate, Globe, Angle and Check Valves

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA AB 1 (1993) Molded Case Circuit Breakers and Molded Case Switches

NEMA ICS 2 (1993) Industrial Controls and Systems Controllers, Contactors, and Overload Relays Rated Not More Than 2,000 Volts AC or 750 Volts DC

NEMA ICS 6 (1993) Industrial Control and Systems, Enclosures

NEMA WC 7	(1988; Rev 3 1996) Cross-Linked-Thermosetting-Polyethylene-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
NEMA WC 8	(1988; Rev 3 1996) Ethylene-Propylene-Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
NEMA MG 1	(1998) Motors and Generators
NEMA PB 1	(1995) Panelboards
NEMA SG 3	(1995) Power Switching Equipment

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 30	(1996; Errata TIA 96-2) Flammable and Combustible Liquids Code
NFPA 37	(1998) Installation and Use of Stationary Combustion Engines and Gas Turbines
NFPA 70	(1999) National Electrical Code

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE ARP 892	(1965; R 1994) D-C Starter-Generator, Engine
SAE J 537	(1996) Storage Batteries

UNDERWRITERS LABORATORIES (UL)

UL 489	(1996; Rev thru Dec 1998) Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
UL 891	(1994; Rev thru Jan 1995) Dead-Front Switchboards
UL 1236	(1994; Rev thru Mar 1999) Battery Chargers for Charging Engine-Starter Batteries

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Layout; G
Drawings; G

- a. Base-mounted equipment, complete with base and attachments including anchor bolt template and recommended clearances for maintenance and operation.
- b. Starting system.
- c. Fuel system.
- d. Cooling system.
- e. Exhaust system.
- f. Electric wiring of relays, breakers, programmable controllers, and switches including single line and wiring diagrams.
- g. Lubrication system, including piping, pumps, strainers, filters, heat exchangers for lube oil and turbocharger cooling, electric heater, controls and wiring.
- h. Location, type, and description of vibration isolation devices.
- i. The safety system, including wiring schematics.
- j. One-line schematic and wiring diagrams of the generator, exciter, regulator, governor, and all instrumentation.
- k. Panel layouts.
- l. Mounting and support for each panel and major piece of electrical equipment.

m. Engine-generator set rigging points and lifting instructions.

Acceptance; G

Drawings, which accurately depict the as-built configuration of the installation, upon acceptance of the diesel-generator, set installation. Layout drawings shall be revised to reflect the as-built conditions and submitted with the as-built drawings.

SD-03 Product Data

Performance Tests; G

Calculations of the engine and generator output power capability, including efficiency and parasitic load data.

Sound Limitations; G

Sound power level data for the packaged unit operating at 100% load in a free field environment. The data should demonstrate compliance with the sound limitation requirements of this specification.

Generator; G

Each generator KW rating and short circuit capacity (both symmetric and asymmetric).

Day Tank; G

Calculations for the capacity of each day tank, including allowances for recirculated fuel, usable tank capacity, and duration of fuel supply.

Power Factor; G

Generator capability curve showing generator kVA output (kW vs. kvar) for both leading and lagging power factors ranging from 0 to 1.0.

Heat Rejected to Engine-Generator Space; G

Manufacturers data to quantify heat rejected to the space with the engine generator set at rated capacity.

Time-Delay on Alarms; G

The magnitude of monitored values, which define alarm or action, set points, and the tolerance (plus and/or minus) at which the device activates the alarm or action.

Cooling System; G

- a. The maximum and minimum allowable inlet temperatures of the coolant fluid.
- b. The maximum allowable temperature rise in the coolant fluid.
- c. The minimum allowable inlet fuel temperature.

Manufacturer's Catalog; G

Manufacturer's standard catalog data describing and depicting each engine-generator set and all ancillary equipment in sufficient detail to demonstrate specification compliance.

Vibration Isolation; G

Vibration isolation system performance data for the range of frequencies generated by the engine-generator set during operation from no load to full load and the maximum vibration transmitted to the floor. Description of seismic zone C or equivalent qualification of the engine-generator mounting, base, and vibration isolation.

Instructions; G

Instructions including: the manufacturer's pre-start checklist and precautions; startup procedures for test mode, manual-start mode, and automatic-start mode, (as applicable); running checks, procedures, and precautions; and shutdown procedures, checks, and precautions. Instructions shall include procedures for interrelated equipment (such as heat recovery systems, co-generation, load-shedding, and automatic transfer switches). Instructions shall be weatherproof, laminated in plastic, framed, and posted where directed. Posted data shall include wiring and control diagrams showing the key mechanical and electrical control elements, and a diagrammatic layout of the system.

Experience; G

Statement and locations showing that each component manufacturer has a minimum of 3 years experience in the manufacture, assembly and sale of components used with stationary diesel-engine generator sets for commercial and industrial use of similar generator set size, location and function as that identified in the construction documents.

Field Engineer;

A letter listing the qualifications, schools, formal training, and experience of the field engineer.

Site Welding;

A letter listing the welder qualifying procedures for each welder, complete with supporting data such as test procedures used, what was tested to, and a list of the names of all welders and their qualifications symbols.

General Installation; G

A complete copy of the manufacturer's installation procedures. A detailed description of the manufacturer's recommended break-in procedure.

Site Visit;

A site visit letter stating the date the site was visited and listing discrepancies found.

SD-06 Test Reports

Onsite Inspection and Tests; G,

a. A letter giving notice of the proposed dates of all onsite inspections and tests at least 14 days prior to beginning tests.

b. A detailed description of the Contractor's proposed procedures for onsite tests including the test including the test plan and a listing of equipment necessary to perform the tests. Submission shall be at least 7 days prior to beginning tests.

c. Six copies of the onsite test data described below in 216 x 279 mm (8-1/2 x 11 inch) 3-ring binders with a

separate section for each test. Sections shall be separated by dividers with tabs. Data plots shall be full size 216 x 279 mm (8-1/2 x 11 inches) minimum), showing all grid lines, with full resolution.

- (1) A description of the procedures for onsite tests.
- (2) A list of equipment used, with calibration certifications.
- (3) A copy of measurements taken, with required plots and graphs.
- (4) The date of testing.
- (5) The parameters verified.
- (6) The condition specified for the parameter.
- (7) The test results, signed and dated.
- (8) A description of all adjustments made.

SD-07 Certificates

Vibration Isolation; G

Torsional analysis including prototype testing or calculations, which certify and demonstrate that no damaging or dangerous torsional vibrations will occur when the prime mover is connected to the generator, at synchronous speeds, plus/minus 10%.

Prototype Tests;

Manufacturer's standard certification that prototype tests were performed for the generator model proposed.

Reliability and Durability; G

Documentation, which cites engines and generators in similar service to demonstrate compliance with the requirements of this specification. Certification does not exclude annual technological improvements made by a manufacturer in the basic standard model set on which experience was obtained, provided parts interchangeability has not been substantially affected and the current standard model meets all the performance requirements of this specification. For each different set, 2 like sets shall have performed satisfactorily in

a stationary power application, independent and separate from the physical location of the manufacturer's and assembler's facilities, for a minimum of 2 consecutive years without any failure to start, including periodic exercise. The certification shall state that for the set proposed to meet this specification, there were no failures resulting in downtime for repairs in excess of 72 hours or any failure due to overheating during 2 consecutive years of service. Like sets are of the same model, speed, bore, stroke, number and configuration of cylinders, an output powers rating. Like generators are of the same model, speed, pitch, cooling, exciter, voltage regulator and output power rating. A list shall be provided with the name of the installations, completion dates, and name and telephone number of a point of contact.

Emissions; G

A certification from the engine manufacturer stating that the engine exhaust emissions meet federal, state, and local regulations and restrictions specified. At a minimum, this certification shall include emission factors for criteria pollutants including nitrogen oxides, carbon monoxide, particulate matter, sulfur dioxide, non-methane hydrocarbon, and for hazardous air pollutants (HAPs).

Sound limitations; G

A certification from the manufacturer stating that the sound emissions meet the specification.

Flywheel Balance; G

Manufacturer's certification that the flywheel has been statically and dynamically balanced and is capable of being rotated at 125% of rated speed without vibration or damage.

Materials and Equipment; G

A letter stating that where materials or equipment are specified to comply with requirements of UL, or other standards, written proof of such compliance has been obtained. The label or listing of the specified agency, or a written certificate from an approved, nationally recognized testing organization equipped to perform such services, stating that the items have been tested and

conform to the requirements and testing methods of the specified agency are acceptable as proof.

Factory Inspection and Tests; G

A certification that each engine generator set passed the factory tests and inspections and a list of the test and inspections.

Inspections; G

A letter certifying that all facilities are complete and functional, that each system is fully functional, and that each item of equipment is complete, free from damage, adjusted, and ready for beneficial use.

Cooling System; G

Certification that the engine-generator set and cooling system function properly in the ambient temperatures specified.

1.3 SYSTEM DESCRIPTION

Each engine-generator set shall be provided and installed complete and totally functional, with all necessary ancillary equipment to include air filtration; starting system; generator controls, protection, and isolation; instrumentation; lubrication; fuel system; cooling system; and engine exhaust system. Each engine generator set shall satisfy the requirements specified in the Engine Generator Parameter Schedule.

1.3.1 Engine-Generator Parameter Schedule

ENGINE GENERATOR PARAMETER SCHEDULE

Service Load [kW]	[_____] [kVA]
Power Factor	.08
Motor Starting kVA (maximum)	[_____] kVA
Maximum Speed	1800 rpm
Engine-Generator Application	stand-alone

Engine Cooling Type glycol	water/ethylene
Heat Exchanger Type	fin-tube
Governor Type	Isochronous
Frequency Bandwidth (steady state)	$\pm 0.4\%$
Voltage Regulation (No load to full load)	$\pm 2\%$ (max.)
Voltage Bandwidth (steady state)	± 0.5
Frequency	60 Hz
Voltage	[_____] volts
Phases [3 Phase,	[3 Phase, Wye]
	Delta] [1 Phase]
Minimum Generator Subtransient Reactance	12% percent
Nonlinear Loads	[_____] kVA
Max Step Load Increase Service	100% of
	Load at 0.8 PF
Max Step Load Decrease Service Load at (without shutdown)	100 % of
	0.8 PF
Max Time to Start and be Ready to Assume Load	10 seconds
Max Summer Outdoor Temp (Ambient)	49 degrees C
Min Winter Outdoor Temp (Ambient)	-30 degrees C
Installation Elevation level	150M above sea

1.3.2 Output Capacity

Each generator set shall provide power equal to the sum of service load plus the machine's efficiency loss and associated ancillary equipment loads. Rated output capacity shall also consider engine and/or generator over-sizing required to meet requirements in paragraph Engine-Generator Parameter Schedule.

1.3.3 Power Rating

Standby ratings shall be in accordance with **EGSA 101P**.

1.4 GENERAL REQUIREMENTS

1.4.1 Engine-Generator Set

Each set shall consist of one engine, one generator, and one exciter, mounted, assembled, and aligned on one base; and all other necessary ancillary equipment, which may be mounted separately. Sets shall be assembled and attached to the base prior to shipping. Set components shall be environmentally suitable for the locations shown and shall be the manufacturer's standard product offered in catalogs for commercial or industrial use. A generator strip heater shall be provided for moisture control when the generator is not operating.

1.4.2 Nameplates

Each major component of this specification shall have the manufacturer's name, type or style, model or serial number, and rating number on a plate secured to the equipment. As a minimum, nameplates shall be provided for: Engines; Relays; Generators; Day tanks; Transformers (CT & PT); Regulators; Pumps and pump motors; Governors; Generator Breaker; Economizers; Heat exchangers (other than base-mounted).

Engines

Relays

Generators

Day tanks

Transformers (CT & PT)

Regulators

Pumps and pump motors

Governors

Generator Breaker

Economizers

Heat exchangers (other than base-mounted)

Where the following equipment is provided as a standard component by the diesel-engine generator set manufacturer, the nameplate information may be provided in the maintenance manual in lieu of nameplates.

Battery charger	Heaters
Exhaust mufflers	Exciters
Switchgear	Silencers
Battery	

1.4.3 Personnel Safety Device

Exposed moving parts, parts that produce high operating temperatures, parts which may be electrically energized, and parts that may be a hazard to operating personnel during normal operation shall be insulated, fully enclosed, guarded, or fitted with other types of safety devices. The safety devices shall be installed so that proper operation of the equipment is not impaired.

1.4.4 Verification of Dimensions

Before performing work, the premises shall be visited and details of the work verified. The Contracting Officer shall be advised in writing of any discrepancies before performing any work.

1.4.5 Conformance to Codes and Standards

Where equipment is specified to conform to requirements of any code or standard such as UL, the design, fabrication and installation shall conform to the code.

1.4.6 Site Welding

Structural members shall be welded in accordance with Section 05090 WELDING, STRUCTURAL. For all other welding, procedures and welders shall be qualified in accordance with ASME BPVC SEC IX. Welding procedures qualified by others, and welders and welding operators qualified by a previously qualified employer may be accepted as permitted by ASME B31.1. Welder qualification tests shall be performed for each welder whose qualifications are not in compliance with the referenced standards. The Contracting Officer shall be notified 24 hours in advance of qualification tests. The qualification tests shall be performed at the work site if practical. The welder or welding operator shall apply the assigned personal symbol near each weld made as a permanent record

1.4.7 Engine Generator Set Enclosure

The engine generator set enclosure shall be corrosion resistant and fully weather resistant. The enclosure shall contain all set components and provide ventilation to permit operation at rated load under secured conditions. Doors shall be provided for access to all controls and equipment requiring periodic maintenance or adjustment. Removable panels shall be provided for access to components requiring periodic replacement. The enclosure shall be capable of being removed without disassembly of the engine-generator set or removal of components other than exhaust system. The enclosure shall reduce the noise of the generator set to within the limits specified in the paragraph SOUND LIMITATIONS.

1.4.8 Vibration Isolation

The maximum engine-generator set vibration in the horizontal, vertical and axial directions shall be limited to 0.15 mm (6 mils) peak-peak RMS with an overall velocity limit of 24 mm/seconds 0.95 inches/seconds RMS, for all speeds through 110% of rated speed. The engine-generator set shall be provided with vibration-isolation in accordance with the manufacturer's standard recommendation. Where the vibration-isolation system does not secure the base to the structure floor or unit foundation, seismic restraints shall be provided in accordance with the seismic parameters specified.

1.4.9 Experience

Each component manufacturer shall have a minimum of 3 years experience in the manufacture, assembly and sale of components used with stationary diesel engine-generator sets for commercial and industrial use. The engine-generator set manufacture/assembler shall have a minimum of 3 years experience in the manufacture, assembly and sale of stationary diesel engine-generator sets for commercial and industrial use.

1.4.10 Field Engineer

The engine-generator set manufacturer or assembler shall furnish a qualified field engineer to supervise the complete installation of the engine-generator set, assist in the performance of the onsite tests, and instruct personnel as to the operational and maintenance features of the equipment. The field engineer shall have attended the engine-generator manufacturer's training courses on installation and operation and maintenance for engine generator sets.

1.4.11 Seismic Requirements

Seismic requirements shall be in accordance with Sections 13080 SEISMIC PROTECTION FOR MISCELLANEOUS EQUIPMENT, 15070 SEISMIC PROTECTION FOR MECHANICAL EQUIPMENT and 16070 SEISMIC PROTECTION FOR ELECTRICAL EQUIPMENT [as shown on the drawings]. All emergency/standby generators shall be mounted on spring isolators rated for seismic zone "C".

1.5 STORAGE AND INSTALLATION

The Contractor shall properly protect material and equipment in accordance with the manufacturers recommended storage procedures, before, during, and after installation. Stored items shall be protected from the weather and contamination. During installation, piping and similar openings shall be capped to keep out dirt and other foreign matter.

1.6 OPERATION AND MAINTENANCE MANUALS

The operation and maintenance manuals shall be submitted and approved prior to commencing onsite tests.

1.6.1 Operation Manual

Three copies of the manufacturers standard maintenance manual.
(All available manuals)

a. Procedures for each routine maintenance item. Procedures for troubleshooting. Factory-service, takedown overhaul, and repair service manuals, with parts lists.

b. The manufacturer's recommended maintenance schedule.

c. A component list, which includes the manufacturer's name, address, type or style, model or serial number, rating, and catalog number for the major components, listed in paragraph GENERAL REQUIREMENTS.

d. A list of spare parts for each piece of equipment and a complete list of materials and supplies needed for operation.

e. One hard copy of each manual and 2 complete copies of CD's shall be permitted instead of 3 hard copies.

1.6.1 Deleted

1.6.2 Maintenance Manual

Three copies of the [manufacturers standard maintenance manual] [maintenance manual containing the information described below in 216 x 279 mm (8-1/2 x 11 inch) three-ring binders shall be provided. Each section shall be separated by a heavy plastic divider with tabs. Drawings shall be folded, with the title block visible, and placed in plastic pockets with reinforced holes].

- a. Procedures for each routine maintenance item.
Procedures for troubleshooting. Factory-service, overhaul, and repair service manuals, with parts lists.
- b. The manufacturer's recommended maintenance schedule.
- c. A component list, which includes the manufacturer's name, address, type or style, model or serial number, rating, and catalog number for the major components, listed in paragraph GENERAL REQUIREMENTS.
- d. A list of spare parts for each piece of equipment and a complete list of materials and supplies needed for operation.

1.7 SPECIAL TOOLS AND FILTERS

Two sets of special tools and two sets of filters required for maintenance shall be provided. Special tools are those that only the manufacturer provides, for special purposes, or to reach otherwise inaccessible parts this also includes, software, hardware, cables and connectors and laptop computer if required for re-programming of any component. One handset shall be provided for each electronic governor when required to indicate and/or change governor response settings. Two complete sets of filters shall be supplied in a suitable storage box. These filters shall be in addition to filters replaced after testing.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Materials and equipment shall be as specified.

2.1.1 Circuit Breakers, Low Voltage

NEMA AB 1, UL 489, and NEMA SG 3.

2.1.2 Filter Elements (Fuel-oil, Lubricating-oil, and Combustion-air)

Manufacturer's standard.

2.1.3 Instrument Transformers

ANSI C12.11.

2.1.4 Pipe (Sleeves, Fuel/Lube-oil, Compressed-Air, Coolant and Exhaust)

ASTM A 53/A 53M, ASTM A 106 or ASTM A 135, steel pipe. Pipe smaller than 50 mm (2 inches) shall be Schedule 80. Pipe 50 mm (2 inches) and larger shall be Schedule 40.

2.1.5 Pipe Flanges and Fittings

- a. Pipe Flanges and Flanged Fittings: ASTM A 181/A 181M, Class 60, or ASME B16.5, Grade 1, Class 150.
- b. Pipe Welding Fittings: ASTM A 234/A 234M, Grade WPB or WPC, Class 150, or ASME B16.11, 1360.7 kg. (3000 lb.)
- c. Threaded Fittings: ASME B16.3, Class 150.
- d. Valves: MSS SP-80, Class 150.
- e. Gaskets: Manufacturers Standard.

2.1.6 Pipe Hangers

MSS SP-58 and MSS SP-69.

2.1.7 Electrical Enclosures

2.1.7.1 General

NEMA ICS 6.

2.1.7.2 Panel-boards

NEMA PB 1.

2.1.8 Electric Motors

Electric motors shall conform to the requirements of NEMA MG 1. Motors shall have sealed ball bearings, a maximum speed of 1800 rpm and integral automatic or manual reset thermal overload protectors. Motors used indoors shall have drip proof frames; those used outside shall be totally enclosed. AC motors larger than 373 W (1/2 Hp) (1/2 Hp) shall be of the squirrel cage induction type for standard voltage of 460 volts, 60 Hz three

phase power. AC motors 373 W (1/2 Hp) (1/2 Hp) or smaller, shall be for standard voltage **115** volts, 60 Hz single-phase power.

2.1.9 Motor Controllers

Motor controllers and starters shall conform to the requirements of **NFPA 70** and **NEMA ICS 2**.

2.2 ENGINE

Each engine shall operate on No. 2-D diesel conforming to **ASTM D 975**, shall be designed for stationary applications and shall be complete with ancillaries. The engine shall be a standard production model described in the **manufacturer's catalog**. The engine shall, supercharged or turbocharged. The engine shall be four-stroke-cycle and compression-ignition type. The engine shall be vertical inline, V-, or opposed-piston type, with a solid cast block or individually cast cylinders. The engine shall have a minimum of two cylinders. Opposed-piston type engines shall have no less than four cylinders. Each block shall have a coolant drain port. Each engine shall be equipped with an over-speed sensor.

2.3 FUEL SYSTEM

The fuel system for each engine generator set shall conform to the requirements of **NFPA 30** and **NFPA 37** and contain the following elements.

2.3.1 Pumps

2.3.1.1 Main Pump

Each engine shall be provided with an engine driven pump. The pump shall supply fuel at a minimum rate sufficient to provide the amount of fuel required to meet the performance indicated within the parameter schedule. The fuel flow rate shall be based on meeting the load requirements and all necessary recirculation.

2.3.1.2 Auxiliary Fuel Pump

Auxiliary fuel pumps shall be provided to maintain the required engine fuel pressure, either required by the installation or indicated on the drawings. The auxiliary pump shall be driven by a dc electric motor powered by the starting/station batteries. The auxiliary pump shall be automatically actuated by a pressure-detecting device.

2.3.2 Filter

A minimum of one full flow fuel filter shall be provided for each engine. The filter shall be readily accessible and capable of being changed without disconnecting the piping or disturbing other components. The filter shall have inlet and outlet connections plainly marked.

2.3.3 Relief/Bypass Valve

A relief/bypass valve shall be provided to regulate pressure in the fuel supply line, return excess fuel to a return line, and prevent the build-up of excessive pressure in the fuel system.

2.3.4 Day Tank

Each engine shall be provided with a separate self-supporting day tank if required. Each day tank shall be provided with connections for fuel supply line, fuel return line, fuel overflow line, local fuel fill port, gauge, vent line, drain line, and float switch assembly for control. A fuel return line cooler shall be provided as recommended by the manufacturer and assembler. The temperature of the fuel returning to the day tank shall be below the flash point of the fuel. A temperature-sensing device shall be installed in the fuel supply line.

2.3.4.1 Capacity

Each tank shall have capacity to supply fuel to the engine for an uninterrupted 2-hour period at 100% rated load without being refilled or 25 gallons, which ever is recommended or specified.

2.3.4.2 Local Fuel Fill

Each local fuel fill port on the day tank shall be provided with a screw-on cap.

2.3.4.3 Fuel Level Controls

- a. Each tank shall have a float-switch assembly to perform the following functions:

- (1) Activate the "Low Fuel Level" alarm at 70% of the rated tank capacity.

- (2) Activate the "Overfill Fuel Level" alarm at 95% of the rated tank capacity.

2.3.4.4 Arrangement

Gravity flow tanks and any tank that allows a fuel level above the fuel injectors shall be provided with an internal or external factory installed valve located as near as possible to the shell of the tank. The valve shall close when the engine is not operating.

2.3.5.1 Capacity, Standby

Each day tank shall have capacity to supply fuel to the engine for an uninterrupted 2-hour period at 100% rated load without being refilled, plus any fuel, which may be returned to the main fuel storage tank. The calculation of the capacity of each day tank shall incorporate the requirement to stop the supply of fuel into the day tank at 90% of the ultimate volume of the tank.

2.3.5.2 Drain Line

Each day tank drain line shall be accessible and equipped with a shutoff valve. Self-supporting day tanks shall be arranged to allow drainage into a 305 mm (12 inch) tall bucket.

2.3.5.3 Local Fuel Fill

Each local fuel fill port on the day tank shall be provided with a screw-on cap.

2.3.5.4 Fuel Level Controls

a. Each day tank shall have a float-switch-assembly to perform the following functions:

(1) Activate the "Overfill Fuel Level" alarm at 95% of the rated tank volume.

(2) Activate the "Low Fuel Level" alarm at 70% of the rated tank Capacity.

2.3.5.5 Arrangement

Day tanks may allow gravity flow into the engine. Gravity flow tanks shall be provided with an internal or external valve located as near as possible to the shell of the tank. The valve shall close when the engine is not operating. Day tanks shall be provided with any necessary pumps to supply fuel to the engine as recommended by the generator set manufacturer. The fuel supply line from the day tank to the manufacturer's standard engine connection shall be threaded pipe.

2.3.6 Fuel Supply System

The fuel supply from the main storage of fuel to the day tank shall be as specified in Section 13202 FUEL STORAGE SYSTEMS.

2.4 LUBRICATION

Each engine shall have a separate lube-oil system conforming to NFPA 30 and NFPA 37. Each system shall be pressurized by engine-driven oil pumps. Each system shall be furnished with a relief valve for oil pressure regulation (for closed systems) and a dipstick for oil level indications. The crankcase shall be vented in accordance with the manufacturer's recommendation except that it shall not be vented to the engine exhaust system. Crankcase breathers, if provided on engines installed in buildings or enclosures, shall be piped to vent to the outside. The system shall be readily accessible for service such as draining, refilling, etc. Each system shall permit addition of oil and have oil-level indication with the set operating. The system shall utilize an oil cooler as recommended by the engine manufacturer.

2.4.1 Filter

One full-flow filter shall be provided for each pump. The filter shall be readily accessible and capable of being changed without disconnecting the piping or disturbing other components. The filter shall have inlet and outlet connections plainly marked.

2.4.2 Lube-Oil Sensors

Each engine shall be equipped with lube-oil pressure sensors. Pressure sensors shall be located downstream of the filters and provide signals for required indication and alarms.

2.5 COOLING SYSTEM

Each engine cooling system shall operate automatically while the engine is running. Each cooling system shall be sized for the maximum summer outdoor design temperature and site elevation. Water-cooled system coolant shall use a combination of water and ethylene-glycol sufficient for freeze protection at the minimum winter outdoor temperature specified. The maximum temperature rise of the coolant across the engine shall be no more than that recommended and submitted in accordance with paragraph SUBMITTALS.

2.5.1 Coolant Pumps

Coolant pumps shall be the centrifugal type. Each engine shall have an engine-driven primary pump. Secondary pumps shall be electric motor driven and have automatic controllers.

2.5.2 Deleted

2.5.2.1 Fin-Tube-Type Heat Exchanger (Radiator)

Heat exchanger may be factory coated with corrosive resistant film providing that corrosion measures are taken to restore the heat rejection capability of the radiator to the initial design requirement via over-sizing, or other compensating methods. Internal surfaces shall be compatible with liquid fluid coolant used. Materials and coolant are subject to approval by the Contracting Officer. Heat exchangers shall be pressure type incorporating a pressure valve, vacuum valve and a cap. Caps shall be designed for pressure relief prior to removal. Each heat exchanger and the entire cooling system shall be capable of withstanding a minimum pressure of 48-kPa gauge (7 psi). (7 psi.) Each heat exchanger shall be protected with a strong grille or screen guard. Each heat exchanger shall have at least two tapped holes. One tapped hole in the heat exchanger shall be equipped with a drain cock, the rest shall be plugged.

2.5.3 Expansion Tank

The cooling system shall include an air expansion tank tank, which will accommodate the expanded water of the system generated within the normal operating temperature range, limiting the pressure increase at all components in the system to the maximum allowable pressure at those components. The tank shall be suitable for an operating temperature of 121 degrees C (250 degrees F) and a working pressure of 0.86 MPa (125 psi). (125 psi.) The tank shall be constructed of welded steel, tested and stamped in accordance with ASME BPVC SEC VIII D1 for the stated working pressure. A bladder type tank shall not be used. Steel legs or bases for vertical installation shall support the tank.

2.5.5 Temperature Sensors

Each engine shall be equipped with coolant temperature sensors. Temperature sensors shall provide signals for pre-high and high indication and alarms.

2.6 SOUND LIMITATIONS

The noise generated by the diesel generator set operating at 100 percent load shall not exceed the following sound pressure levels in any of the indicated frequencies when measured in a

free field at a radial distance of 7 meters (22.9 feet) at 45 degrees apart in all directions.

Frequency Band (Hz)	Maximum Acceptable Pressure Level (Decibels)
31	[_81__]
63	[_77__]
125	[_71__]
250	[_64__]
500	[_58__]
1,000	[_55__]
2,000	[_54__]
4,000	[_54__]
8,000	[_56__]

2.7 AIR INTAKE EQUIPMENT

Filters and silencers shall be provided in locations that are convenient for servicing. The silencer shall be of the high-frequency filter type, located in the air intake system as recommended by the engine manufacturer. Silencer shall be capable of reducing the noise level at the air intake to a point below the maximum acceptable levels specified in paragraph SOUND LIMITATIONS. A combined filter-silencer unit meeting requirements for the separate filter and silencer items may be provided. Expansion elements in air-intake lines shall be rubber.

2.8 EXHAUST SYSTEM

The system shall be separate and complete for each engine. Piping shall be supported so as to minimize vibration. Where a V-type engine is provided, a V-type connector with necessary flexible sections and hardware shall connect the engine exhaust outlets.

2.8.1 Flexible Sections and Expansion Joints

A flexible section at each engine and an expansion joint at each muffler shall be provided. Flexible sections and expansion joints shall have flanged connections. Flexible sections shall be made of convoluted seamless tube without joints or packing. Expansion joints shall be the bellows type. Expansion and flexible elements shall be stainless steel suitable for diesel-engine exhaust gas at the maximum exhaust temperature that is specified by the engine manufacturer.

Expansion and flexible elements shall be capable of absorbing vibration from the engine and compensation for thermal expansion and contraction.

2.8.2 Exhaust Muffler

A chamber type exhaust muffler shall be provided. The muffler shall be constructed of welded steel and designed for [outside] [inside] [vertical] [horizontal] mounting. Eyebolts, lugs, flanges, or other items shall be provided as necessary for support in the location and position indicated. Pressure drop through the muffler shall not exceed the recommendations of the engine manufacturer. Outside mufflers shall be zinc coated or painted with high temperature 204 degrees C (400 degrees F) resisting paint. The muffler and exhaust piping together shall reduce the noise level to less than the maximum acceptable level listed for sound limitations in paragraph SOUND LIMITATIONS. The muffler shall have a drain valve, nipple, and cap at the low-point of the muffler.

2.8.3 Exhaust Piping

Exhaust muffler shall be provided for each engine, size and type as recommended by the generator set manufacturer. A chamber type exhaust muffler shall be provided. The muffler shall be constructed of welded steel and designed for outside horizontal mounting. Eyebolts, lugs, flanges, or other items shall be provided as necessary for support in the location and position indicated. Pressure drop through the muffler shall not exceed the recommendations of the engine manufacturer. Outside mufflers shall be zinc coated or painted with high temperature, 204o C resisting paint. The muffler and exhaust piping together shall reduce the noise level to less than the maximum acceptable level listed for sound limitations. The muffler shall have a drain valve, nipple, and cap at the low-point of the muffler.

A flexible section at each engine and an expansion joint at each muffler shall be provided. Flexible sections and expansion joints shall have flanged connections. Flexible sections shall be made of convoluted seamless tube without joints or packing. Expansion joints shall be the bellows type. Expansion and flexible elements shall be stainless steel suitable for diesel engine exhaust gas at the maximum exhaust temperature that is specified by the engine manufacturer. Expansion and flexible elements shall be capable of absorbing vibration form the engine and compensation for thermal expansion and contraction.

Exhaust Piping: Horizontal sections of exhaust piping shall be sloped downward away from the engine to a condensate trap and drain valve. Changes in direction shall be long-radius. Exhaust piping shall be provide with a hinged gravity operated, self-closing rain cover.

2.9 EMISSIONS

The finished installation shall comply with Federal, state, and local regulations and restrictions regarding the limits of emissions.

2.10 STARTING SYSTEM

The starting system for standby engine generator sets used in emergency applications shall be in accordance with NFPA 99 and NFPA 110 and as follows

2.10.1 Controls

An engine control switch shall be provided with functions including: run/start (manual), off/reset, and automatic mode. Start-stop logic shall be provided for adjustable cycle cranking and cool down operation. The logic shall be arranged for manual starting and fully automatic starting in accordance with paragraph AUTOMATIC ENGINE-GENERATOR SET SYSTEM OPERATION. Electrical starting systems shall be provided with an adjustable cranking limit device to limit cranking periods from 1 second up to the maximum duration.

2.10.2 Capacity

The starting system shall be of sufficient capacity, at the maximum outdoor summer temperature specified to crank the engine without damage or overheating. The system shall be capable of providing a minimum of three cranking periods with 15-second intervals between cranks. Each cranking period shall have a maximum duration of 15 seconds.

2.10.3 Functional Requirements

Starting system shall be manufacturers recommended dc system utilizing a negative circuit ground. Starting motors shall be in accordance with [SAE ARP 892](#).

2.10.4 Battery

A starting battery system shall be provided and shall include the battery, battery rack, inter-cell connectors, and spacers.

The battery shall be in accordance with SAE J 537. Critical system components (rack, protection, etc.) shall be sized to withstand the seismic acceleration forces specified. The battery shall be lead-acid non-maintenance type, with sufficient capacity, at the minimum outdoor winter temperature specified to provide the specified cranking periods. Valve-regulated lead-acid batteries are not acceptable.

2.10.5 Battery Charger

A 10-amp voltage regulated battery charger shall be provided for each engine generator set. Charger may be mounted in an automatic transfer switch if desired. Chargers shall not be mounted on the generator set. Charger shall be equipped with float, taper and equalize charge settings. Operations monitors shall provide visual output along with individual from C contacts rated at 4-amps, 120 VAC, 30 VDC from remote indication of:

Loss of AC power - RED Light

Low battery voltage - RED Light

High battery voltage - RED Light

Power ON - GREEN Light (no relay contact)

2.10.6 Starting Aids

The manufacturer shall provide one or more of the following methods to assist engine starting.

2.10.6.1 Deleted

2.10.6.2 Jacket-Coolant Heaters

A thermostatically controlled electric heater shall be mounted in the engine coolant jacketing to automatically maintain the coolant within plus or minus 3 degrees of the control temperature. The heater shall operate independently of engine operation so that starting times are minimized. The control temperature shall be the temperature recommended by the engine manufacturer to meet the starting time specified.

2.11 GOVERNOR

Each engine shall be provided with a governor, which maintains the frequency within a bandwidth of the rated frequency, over a steady-state load range of zero to 100% of rated output capacity. The governor shall be configured for safe manual

adjustment of the speed/frequency during operation of the engine generator set, without special tools, from 90 to 110 % of the rated speed/frequency, over a steady state load range of zero to 100% of rated capacity. Isochronous governors shall maintain the midpoint of the frequency bandwidth at the same value for steady-state loads over the range of zero to 100% of rated output capacity

2.12 GENERATOR

Each generator shall be of the synchronous type, one or two bearing, conforming to NEMA MG 1, equipped with winding terminal housings in accordance with NEMA MG 1, equipped with an amortisseur winding, and directly connected to the engine. Insulation shall be Class H standby rating at a minimum of 130 ° C temperature rise. Generator design shall protect against mechanical, electrical and thermal damage due to vibration, 25 percent over-speeds, or voltages and temperatures at a rated output capacity of 100 percent. Generator ancillary equipment shall meet the short circuit requirements of NEMA MG 1. Frames shall be the drip-proof type.

2.12.1 Current Balance

At 100 percent rated load, and load impedance equal for each of the three phases, the permissible current difference between any two phases shall not exceed 2 percent of the largest current on either of the two phases.

2.12.2 Voltage Balance

At any balanced load between 75 and 100 percent of rated load, the difference in line-to-neutral voltage among the three phases shall not exceed 1 percent of the average line-to-neutral voltage. For a single-phase load condition, consisting of 25 percent load at unity power factor placed between any phase and neutral with no load on the other two phases, the maximum simultaneous difference in line-to-neutral voltage between the phases shall not exceed 3 percent of rated line to neutral voltage. The single-phase load requirement shall be valid utilizing normal exciter and regulator control. The interpretation of the 25 percent load for single-phase load conditions means 25 percent of rated current at rated phase voltage and unity power factor.

2.12.3 Waveform

The deviation factor of the line-to-line voltage at zero load and at balanced full rated load at 0.8 power factor shall not

exceed 10%. The RMS of all harmonics shall be less than 5.0% and that of any one harmonic less than 3.0% at full rated load. Each engine-generator shall be designed and configured to meet the total harmonic distortion limits of IEEE Std 519.

2.13 EXCITER

The generator exciter shall be of the brushless type. Semiconductor rectifiers shall have a minimum safety factor of 300% for peak inverse voltage and forward current ratings for all operating conditions, including 110% generator output at 40 degrees C (104 degrees F) ambient. The exciter and regulator in combination shall maintain generator-output voltage within the limits specified.

2.14 VOLTAGE REGULATOR

Each generator shall be provided with a solid-state voltage regulator, separate from the exciter. The regulator shall maintain the voltage within a bandwidth of the rated voltage, over a steady-state load range of zero to 100% of rated output capacity. Regulator shall be configured for safe manual adjustment of the engine generator voltage output without special tools, during operation from 90 to 110% of the rated voltage over the steady state load range of zero to 100% of rated output capacity. Regulation drift shall not exceed plus or minus 0.5% for an ambient temperature change of 20 degrees C. (36 degrees F.)

2.14.1 Steady State Performance (Regulation or Voltage Droop).

The voltage regulator shall have a maximum droop of 2% of rated voltage over a load range from 0 to 100% of rated output capacity and automatically maintain the generator output voltage within the specified operational bandwidth.

2.15 GENERATOR PROTECTION

Short circuit and overload protection for the generator shall be provided. The generator circuit breaker (IEEE Device 52) ratings shall be consistent with the generator rated voltage and frequency, with continuous, short circuit and interrupting current ratings to match the generator capacity. The manufacturer shall determine the short circuit current interrupting rating of the breaker. The breaker shall be engine generator base mounted by the engine-generator set manufacturer. UL listed molded case thermal magnetic type rated at [____] amps, [____] pole, and [____] volts. Each breaker shall be provided with shunt trip and wired to the

engine fault conditions. Field circuit breakers shall not be acceptable for generator over-current protection. Surge protection shall be provided for each phase of the generator, to be mounted at the generator terminals.

2.15.1 Panel-boards

Panel-boards shall be metal-enclosed, general purpose, [3-phase, 4-wire], [1-phase, 3-wire], [600][_____] volt rated, with neutral bus and continuous ground bus, conforming to NEMA PB 1 and UL 891. Neutral bus and ground bus capacity shall be [as shown][full capacity]. Enclosure designs, construction, materials and coatings shall be [as indicated][suitable for the application and environment]. Bus continuous current rating shall be [at least equal to the generator rating and correspond to UL listed current ratings specified for panelboards and switchboards][as indicated]. Current withstand rating (short circuit rating) shall match the generator capacity. Buses shall be copper.

2.15.2 Devices

Switches, circuit breakers, switchgear, fuses, relays, and other protective devices shall be as specified in Section 16475 COORDINATED POWER SYSTEM PROTECTION.

2.16 SAFETY SYSTEM

Devices, wiring, remote panels, local panels, etc., shall be provided and installed as a complete system to automatically activate the appropriate signals and initiate the appropriate actions. The safety system shall be provided with a self-test method to verify its operability. Alarm signals shall have manual acknowledgement and reset devices. The alarm signal systems shall reactivate for new signals after acknowledgment is given to any signal. The systems shall be configured so that loss of any monitoring device shall be dealt with as an alarm on that system element.

2.16.1 Audible Signal

The audible alarm signal shall sound at a frequency of 70 Hz at a volume of 75 dB at 3.1 m (10 feet). The sound shall be continuously activated upon alarm and silenced upon acknowledgment. Signal devices shall be located as shown.

2.16.2 Visual Signal - Signal

The visual alarm signal shall be a panel light. The light shall be normally off, activated to be blinking upon alarm. The light shall change to continuously light upon acknowledgement. If automatic shutdown occurs, the display shall maintain activated status to indicate the cause of failure and shall not be reset until cause of alarm has been cleared and/or restored to normal condition. Shutdown alarms shall be red; all other alarms shall be amber.

2.16.3 Alarms and Action Logic

2.16.3.1 Shutdown

Simultaneous activation of the audible signal, activation of the visual signal, stopping the engine, and opening the generator main circuit breakers shall be accomplished.

2.16.3.2 Problem

Activation of the visual signal shall be accomplished.

2.16.4 Local Alarm Panel

Device/Condition/ Manufacturers Function	Action/Location/ Function	No. of Offering
Low Coolant Level	SD/CP VA	3
Overvoltage Protection Shutdown	SD/CP VA O	3
Underfrequency	SD/CP VA	1
Undervoltage	SD/CP VA	1
Magnetic Pickup Failure	SD/CP VA	1
Overcurrent	SD/CP VA	1
Short Circuit	SD/CP VA	1
Auxiliary Fault Alarm	CP VA	1
Audible Alarm	CP AA	1
Overcurrent	CP VA	1
Oil Pressure Sender Fault	CP VA	1
Weak Battery	CP VA	1

A local alarm panel shall be provided with the following shutdown and alarm functions [as indicated] [in accordance with NFPA [99] [110 level [1] [2]] and including the listed Corps of Engineers requirements, mounted either on or adjacent to the engine generator set.

Device/ Condition/ Function	What/Where/Size	NFPA 99	NFPA 110 Level 1	NFPA 110 Level 2	Corps of Engrs Required
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Shutdowns
W/Alarms

High engine temperature	Automatic/ jacket water/ cylinder	SD/CP VA	SD/CP VA	SD/CP VA	SD VA
Low lube-oil pressure	Automatic/ pressure/ level	SD/CP VA	SD/CP VA	SD/CP VA	SD VA
Overspeed shutdown \$ alarm	(110% (+ 2%) of rated speed	SD/CP VA	SD/CP VA	SD/CP VA	SD VA
Overcrank failure to start	Automatic/ Failure to to start	SD/CP VA	SD/CP VA	SD/CP VA	
Air shutdown damper (200-600kW)	When used		SD/CP VA	SD/CP VA	
Day tank overfill limit indication & transfer pump shutdown (95% volume)	Automatic/Day Tank/Level				SD/OPA (Pump)
Red emergency stop switch	Manual Switch		SD/CP VA	SD/CP VA	SD VA
Failure to crank	Corps of Engrs. Required				
[Day tank] [Integral Main Fuel Tank] low fuel limit Device/ Condition/ indication (70% volume remaining)	Corps of Engrs. Required				

Alarms

Low lube-oil pressure	Pressure/ level	CP VA	CP VA	CP VAO	CP VA
Low fuel level	Main tank, 3 hours remaining	VA/AA	CP VA	CP VAO	
High fuel	Integral Main				CP VA

level	Fuel Storage Tank 95% Volume				
Low coolant	Jacket water	CP/VA	CP VA	CP VA	
Pre-high temperature	Jacket water/ cylinder	CP VA	CP VA	CP VAO	CP VA
Pre-low lube-oil pressure		CP VA			CP VA
High battery voltage			CP VA	CP VAO	
Low battery voltage			CP VA	CP VAO	
Battery charger AC failure	AC supply not available		CP VA	CP VAO	
Control switch not in AUTO			CP VA	CP VAO	
Low starting air pressure			CP VA	CP VAO	
Low starting hydraulic pressure			CP VA	CP VAO	

SD - Shut Down
CP - On Control Panel
VA - Visual Alarm
AA - Audible Alarm
O - Optional]

2.16.5 Time-Delay on Alarms

For startup of the engine-generator set, time-delay devices shall be installed bypassing the low lubricating oil pressure alarm during cranking, and the coolant-fluid outlet temperature alarm. The lube-oil time-delay device shall return its alarm to normal status after the engine starts. The coolant time-delay device shall return its alarm to normal status 5 minutes after the engine starts.

2.16.6 Remote Alarm Panel

A remote alarm panel shall be provided as indicated. A remote alarm panel shall be provided in accordance with NFPA 99, NFPA 110 and as follows:

Device/Condition/ Function	What/Where/Size	NFPA 99	NFPA 110 Level 1	NFPA 110 Level 2
Remote annunciator panel	Battery powered		Alarms	
Loads on genset		VA		
Battery charger malfunction		VA		
Low lube-oil	Pressure/level	VA/AA	AA	AAO
Low Temperature	Jacket water	VA/AA	AA	AAO
High Temperature	Jacket water/ cylinder	VA/AA	AA	AAO
Low fuel level	Main tank, 3 hr remaining	VA/AA	AA	AAO
Overcrank	Failure to start	VA/AA	AA	AAO
Overspeed		VA/AA	AA	AAO
Pre-high temperature	Jacket water/ cylinder		AA	
Control switch not in AUTO			AA	
Common alarm contacts for local & remote common alarm			X	X
Audible alarm silencing switch			X	O
Air shutdown damper	When used		AA	AAO
Common fault alarm			AA	

X - Required
 SD - Shut Down
 CP - On Control Panel
 VA - Visual Alarm
 AA - Audible Alarm
 O - Optional]

2.17 ENGINE GENERATOR SET CONTROLS AND INSTRUMENTATION

Devices, wiring, remote panels, local panels, etc., shall be provided and installed as a complete system to automatically activate the appropriate signals and initiate the appropriate actions.

2.17.1 Controls

A local control panel shall be provided with controls [as indicated] [in accordance with NFPA 110 level [1] [2]] [and as follows] mounted on the engine generator set. A remote control panel shall be provided [with devices as indicated] [fully redundant to the local control panel] as required.

Device/Condition/ Function	Corps Requirement	NFPA 110 Level 1	NFPA 110 Level 2	MFG Offering
Controls				
Switch: run/start - off/set - auto	CP			CP/STD
Emergency stop switch & alarm	CP			CP/STD
Lamp test/indicator test	CP	CP VA	CP VA	CP/STD
Common alarm contacts/ fault relay		X	X	CP/O
Panel lighting	CP			CP/STD
Audible alarm & silencing/reset switch	CP			
Voltage adjust for voltage Regulator	CP			CP/STD
Pyrometer display w/selector switch	CP			
Remote emergency stop switch		CP VA	CP VA	
Remote fuel shutoff switch				
Remote lube-oil shutoff switch				

2.17.2 Engine Generator Set Metering and Status Indication

A local panel shall be provided with devices [as indicated] [in accordance with NFPA 110 level [1] [2]] [and as follows] mounted to the engine generator set as indicated. A remote control panel shall be provided [with devices as indicated] [fully redundant to the local control panel] as required.

Device/Condition/Corps Function	Requirement	NFPA 110 Level 1	NFPA 110 Level 2	MFG Offering
Genset Status & Metering				
Genset supplying load		CP VA	CP VAO	CP VAO
System ready				CP/STD
Engine oil pressure	CP			CP/STD
Engine coolant temperature	CP			CP/STD
Engine RPM (Tachometer)	CP			CP/STD

Engine run hours	CP	CP/STD
Pyrometer display w/selector switch	CP	
AC volts (generator), 3-phase	CP	CP/STD
AC amps (generator), 3-phase	CP	CP/STD
Generator frequency	CP	CP/STD
Phase selector switches (amps & volts)	CP	CP/STD
Watts/kW		CP/VA-O
Voltage Regulator Adjustment	CP	

CP - On Control Panel

VA - Visual Alarm

AA - Audible Alarm

O - Optional

STD - Manufacturers Standard Offering

2.18 PANELS

Each panel shall be of the type necessary to provide specified functions. Panels shall be mounted on the engine generator set base by vibration/shock absorbing type mountings. Instruments shall be mounted flush or semi flush. Convenient access to the back of instruments shall be provided to facilitate maintenance. Instruments shall be calibrated using recognized industry calibration standards. Each panel shall be provided with a panel identification plate, which clearly identifies the panel function as indicated. Each instrument and device on the panel shall be provided with a plate that clearly identifies the device and its function as indicated. Panels except the remote alarm panel can be combined into a single panel.

2.18.1 Enclosures

Enclosures shall be designed for the application and environment, conforming to **NEMA ICS 6**, and provided with locking mechanisms, which are keyed alike.

2.18.2 Analog

Analog electrical indicating instruments shall be in accordance with **ANSI C39.1** with semi flush mounting. Switchgear, and control-room panel-mounted instruments shall have 250-degree scales with an accuracy of not less than 1 percent. Unit-

mounted instruments shall be the manufacturer's standard with an accuracy of not less than 2 percent. The instrument's operating temperature range shall be minus 20 to plus 65 degrees C. Distorted generator output voltage waveform of a crest factor less than 5 shall not affect metering accuracy for phase voltages, hertz and amps.

2.18.3 Electronic

Electronic indicating instruments shall be true RMS indicating, 100 percent solid state, microprocessor controlled to provide all specified functions. Control, logic, and function devices shall be compatible as a system, sealed, dust and water tight, and shall utilize modular components with metal housings and digital instrumentation. An interface module shall be provided to decode serial link data from the electronic panel and translate alarm, fault and status conditions to set of relay contacts. Instrument accuracy shall be not less than 2 percent for unit-mounted devices and 1 percent for control room, panel mounted devices, throughout a temperature range of minus 20 to plus 65 degrees C. Data display shall utilize LED or back lit LCD. Additionally, the display shall provide indication of cycle programming and diagnostic codes for troubleshooting. Numeral height shall be at the minimum height of ¼ inch or manufacturer specifications which ever is larger.

2.18.4 Parameter Display

Indication or readouts of the lubricating-oil pressure, ac voltmeter, ac ammeter, frequency meter, and coolant temperature.

2.18.5 Exerciser

The exerciser shall be in accordance with Section 16410 AUTOMATIC TRANSFER.

2.19 SURGE PROTECTION

Electrical and electronic components shall be protected from, or designed to withstand the effects of surges from switching and lightning.

2.20 AUTOMATIC ENGINE-GENERATOR-SET SYSTEM OPERATION

Fully automatic operation shall be provided for the following operations: engine-generator set starting and source transfer upon loss of normal source; retransfer upon restoration of the normal source; sequential starting; and stopping of each

engine-generator set after cool down. Devices shall automatically reset after termination of their function.

2.20.1 Automatic Transfer Switch

Automatic transfer switches shall be in accordance with Section 16410 AUTOMATIC TRANSFER.

2.20.2 Monitoring and Transfer

Devices shall be provided to monitor voltage and frequency for the normal power source and each engine generator set, and control transfer from the normal source and retransfer upon restoration of the normal source. Functions, actuation, and time delays shall be as described in Section 16410 AUTOMATIC TRANSFER.

2.21 MANUAL ENGINE-GENERATOR SET SYSTEM OPERATION

Complete facilities shall be provided for manual starting and testing of each set without load, loading and unloading of each set.

2.22 BASE

The base shall be constructed of steel. The base shall be designed to rigidly support the engine-generator set, ensure permanent alignment of all rotating parts, be arranged to provide easy access to allow changing of lube-oil, and ensure that alignment will be maintained during shipping and normal operation. The base shall permit skidding in any direction during installation and shall be provided with suitable holes for foundation bolts. The base shall also withstand and mitigate the effects of synchronous vibration of the engine and generator, and shall be provided with suitable holes for anchor bolts and jacking screws for leveling. The base shall be mounted on spring isolators rated for Fort Campbell seismic conditions.

2.23 THERMAL INSULATION

Thermal insulation shall be as specified in Section 15080 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

2.24 PAINTING AND FINISHING

The engine-generator set shall be cleaned, primed and painted in accordance with the manufacturer's standard color and practice.

2.25 FACTORY INSPECTION AND TESTS

Factory inspection and tests shall be performed on each engine-generator set proposed to meet this specification section. Inspections shall be completed and necessary repairs made prior to testing. Inspectors shall look for leaks, looseness, defects in components, and proper assembly. Factory tests shall be NEMA MG 1 routine tests and the manufacturers routine tests.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION

Installation shall provide clear space for operation and maintenance in accordance with NFPA 70 and IEEE C2. Installation of pipe, duct, conduit, and ancillary equipment shall be configured to facilitate easy removal and replacement of major components and parts of the engine-generator set.

3.2 PIPING INSTALLATION

3.2.1 General

Piping shall be non-welded (threaded). Connections at valves shall be threaded. Connections at equipment shall be threaded to the diesel engine may be threaded if the diesel-engine manufacturer's standard connection is threaded. Except as otherwise specified, threaded fittings shall be utilized to allow for complete dismantling and removal of each piping system from the facility without disconnecting or removing any portion of any other system's equipment or piping. Connections to all equipment shall be made with flexible connectors. Pipes extending through the roof shall be properly flashed. Piping shall be installed clear of windows, doors, and openings to permit thermal expansion and contraction without damage to joints or hangers, and with a 15 mm (1/2 inch) drain valve at each low point.

3.2.2 Supports

Hangers, inserts, and supports shall be of sufficient size to accommodate any insulation and shall conform to MSS SP-58 and MSS SP-69. Supports shall be spaced not more than 2.1 m (6 feet) on center for pipes 50 mm (2 inches) in diameter or less, not more than 3.6 m (12 feet) on center for pipes larger than 50 mm (2 inches) (2 inches) but no larger than 100 mm, (4 inches,) and not more than 5.2 m (17 feet) on center for pipes

larger than 100 mm (4 inches) in diameter. Supports shall be provided at pipe bends or change of direction.

3.2.3 Deleted

3.2.4 Cleaning

After fabrication and before assembly, piping interiors shall be manually wiped clean of all debris.

3.2.5 Pipe Sleeves

Pipes passing through construction such as ceilings, floors, or walls shall be fitted with sleeves. Each sleeve shall extend through and be securely fastened in its respective structure and shall be cut flush with each surface. The structure shall be built tightly to the sleeve. The inside diameter of each sleeve shall be 15 mm, (1/2 inch,) and where pipes pass through combustible materials, 25 mm (1 inch) larger than the outside diameter of the passing pipe or pipe covering.

3.3 ELECTRICAL INSTALLATION

Electrical installation shall comply with NFPA 70, IEEE C2, and Section 16415 ELECTRICAL WORK, INTERIOR.

3.3.1 Vibration Isolation

Flexible fittings shall be provided for all conduit, cable trays, and raceways attached to engine-generator sets. Metallic conductor cables installed on the engine generator set and from the engine generator set to equipment not mounted on the engine generator set shall be flexible stranded conductor. Terminations of conductors on the engine generator set shall be crimp-type terminals or lugs.

3.4 FIELD PAINTING

Field painting shall be as specified in Section 09900 PAINTING, GENERAL.

3.5 ONSITE INSPECTION AND TESTS

3.5.1 Test Conditions

3.5.1.1 Data

Measurements shall be made and recorded of parameters necessary to verify that each set meets specified parameters. If the

results of any test step are not satisfactory, adjustments or replacements shall be made and the step repeated until satisfactory results are obtained. Unless otherwise indicated, data shall be taken during engine-generator set operation and recorded in 15 minute intervals and shall include: readings of engine-generator set meters and gauges for electrical and power parameters; oil pressure; ambient temperature; and engine temperatures available from meters and gauges supplied as permanent equipment on the engine-generator set. In the following tests where measurements are to be recorded after stabilization of an engine-generator set parameter (voltage, frequency, current, temperature, etc.), stabilization is considered to have occurred when measurements are maintained within the specified bandwidths or tolerances, for a minimum of four consecutive readings. Electrical measurements shall be performed in accordance with IEEE Std 120. Definitions and terms are in accordance with IEEE Std 100. Temperature limits in the rating of electrical equipment and for the evaluation of electrical insulation shall be in accordance with IEEE Std 1.

3.5.1.2 Power Factor

Engine-generator set operating tests shall be made utilizing a load with 0.8-power factor for all 3-phase installations; a unity of 1.0 power factor shall be used on all single-phase installations.

3.5.1.3 Contractor Supplied Items

The Contractor shall provide all equipment and supplies required for inspections and tests including fuel, test instruments, cables, test leads, and load banks at the specified power factors.

3.5.1.4 Instruments

Readings of panel gauges, meters, displays, and instruments, provided under this specification shall be verified during test runs by test instruments of precision and accuracy greater than the tested items. Test instrument accuracy shall be at least as follows: current, 1.5%; voltage, 1.5%; real power, 1.5%; reactive power, 1.5%; power factor, 3%; frequency, 0.5%. Test instruments shall be calibrated by a recognized standards laboratory within 30 days prior to testing.

3.5.1.5 Sequence

The sequence of testing shall be as specified in the approved testing plan unless variance is authorized by the Contracting

Officer and Local Authority Having Jurisdiction. Field-testing shall be performed in the presence of the Contracting Officer and Local Authority Having Jurisdiction. Tests may be scheduled and sequenced in order to optimize run-time periods; however the following general order of testing shall be followed: Construction Tests; Inspections; Safety run Tests; and Performance Tests and Final Inspection.

3.5.2 Construction Tests

Individual component and equipment functional tests for fuel piping, coolant piping, and lubricating-oil piping, electrical circuit continuity, insulation resistance, circuit protective devices, and equipment not provided by the engine-generator set manufacturer shall be performed prior to connection to the engine-generator set.

3.5.2.1 Piping Test

a. Lube-oil and fuel-oil piping shall be flushed with the same type of fluid intended to flow through the piping, until the out flowing fluid has no obvious sediment or emulsion.

b. Fuel piping which is external to the engine-generator set shall be tested in accordance with NFPA 30. All remaining piping, which is external to the engine generator set shall be pressure tested with air pressure at 150% of the maximum anticipated working pressure, but in no case less than 1 MPa, (150 psig,) for a period of 2 hours to prove the piping has no leaks. If piping is to be insulated, the test shall be performed before the insulation is applied.

3.5.2.2 Electrical Equipment Tests

a. Low-voltage cable insulation integrity tests shall be performed for cables connecting the generator breaker to the [automatic transfer switch] [panel-board] [main disconnect switch] [distribution bus] [_____]. Low-voltage cable, complete with splices, shall be tested for insulation resistance after the cables are installed, in their final configuration, ready for connection to the equipment, and prior to energization. The test voltage shall be 500 volts dc, applied for one minute between each conductor and ground and between all possible combinations conductors in the same trench, duct, or cable, with all other conductors in the same trench, duct, or conduit. The minimum value of insulation shall be:

$R \text{ in megohms} = (\text{rated voltage in kV} + 1) \times 304,800 / (\text{length of cable in meters}).$

$(R \text{ in megohms} = (\text{rated voltage in kV} + 1) \times 1000 / (\text{length of cable in feet}))$

Each cable failing this test shall be repaired or replaced. The repaired cable shall be retested until failures have been eliminated.

- a. Medium-voltage cable insulation integrity tests shall be performed for cables connecting the generator breaker to the [generator switchgear] [main disconnect switch] [distribution bus]. After insulation and before the operating test or connection to an existing system, the medium-voltage cable system shall be given a high potential test. Direct-current voltage shall be applied on each phase conductor of the system by connecting conductors as one terminal and connecting grounds or metallic shielding or sheaths of the cable as the other terminal for each test. Prior to making the test, the cables shall be isolated by opening applicable protective devices and disconnecting equipment. The test shall be conducted with all splices, connectors, and terminations in place. The method, voltage, length of time, and other characteristics of the test for initial installation shall be in accordance with [NEMA WC 7](#) or [NEMA WC 8](#) for the particular type of cable installed, except that 28 kV and 35 kV insulation test voltages shall be in accordance with either [AIEC CS5](#) or [AIEC CS6](#) as applicable, and shall not exceed the recommendations of [IEEE Std 404](#) for cable joints and [IEEE Std 48](#) for cable terminations unless the cable and accessory manufacturers indicate higher voltages are acceptable for testing. Should any cable fail due to a weakness of conductor insulation or due to defects or injuries incidental to the installation or because of improper installation of cable, cable joints, terminations, or other connections, the contractor shall make necessary repairs or replace cables as directed. Repaired or replaced cables shall be retested.
- c. Ground-Resistance Tests. The resistance of [each grounding electrode] [each grounding electrode system] [the ground mat] [the ground ring] shall be measured using the fall-of-potential method defined in [IEEE Std 81](#). Ground resistance measurements shall be made before the electrical distribution system is energized and

shall be made in normally dry conditions not less than 48 hours after the last rainfall. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together below grade. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided.

- 1) Single rod electrode - [25] [_____] ohms.
- 2) Multiple rod electrodes - [_____] ohms.
- 3) Ground mat - [_____] ohms.

- d. Circuit breakers and switchgear shall be examined and tested in accordance with manufacturer's published instructions for functional testing.

3.5.3 Inspections

The following inspections shall be performed jointly by the Contracting Officer the Contractor and Local Authority Having Jurisdiction, after complete installation of each engine-generator set and its associated equipment, and prior to startup of the engine-generator set. Checks applicable to the installation shall be performed. The results of those which are physical inspections (I) shall be documented by the Contractor and submitted in accordance with paragraph SUBMITTALS. The Contractor shall present manufacturer's data for the inspections designated (D) at the time of inspection. Inspections shall verify that equipment type; features, accessibility, installation and condition are in accordance with the contract specification. Manufacturer's statements shall certify provision of features, which cannot be verified visually.

1. Drive belts. (I)
2. Governor type and features. (I)
3. Engine timing mark. (I)
4. Starting motor. (I)
5. Starting aids. (I)
6. Coolant type and concentration. (D)
7. Radiator drains. (I)
8. Block coolant drains. (I)
9. Coolant fill level. (I)
10. Coolant line connections. (I)
11. Coolant hoses. (I)
12. Combustion air filter. (I)
13. Intake air silencer. (I)
14. Lube oil type. (D)
15. Lube oil drain. (I)

16. Lube-oil filter. (I)
17. Lube-oil-fill level. (I)
18. Lube-oil line connections. (I)
19. Lube-oil lines. (I)
20. Fuel type. (D)
21. Fuel-level. (I)
22. Fuel-line connections. (I)
23. Fuel lines. (I)
24. Fuel filter. (I)
25. Access for maintenance. (I)
26. Voltage regulator. (I)
27. Battery-charger connections. (I)
28. Wiring & terminations. (I)
29. Instrumentation. (I)
30. Hazards to personnel. (I)
31. Base. (I)
32. Nameplates. (I)
33. Paint. (I)
34. Exhaust system. (I)
35. Access provided to controls. (I)
36. Enclosure. (I)
37. Engine & generator mounting bolts (proper application). (I)

3.5.4 Safety Run Tests

- a. Perform and record engine manufacturer's recommended pre-starting checks and inspections.
- b. Start the engine, record the starting time, make and record engine manufacturer's after-starting checks and inspections during a reasonable warm-up period.
- b. Activate the manual emergency stop switch and verify that the engine stops.
- d. Remove the high and pre-high lubricating oil temperature sensing elements from the engine and temporarily install temperature gauge in their normal locations on the engine (required for safety, not for recorded data). Where necessary, provide temporary wiring harness to connect the sensing elements to their permanent electrical leads.
- e. Start the engine, record the starting time, make and record engine manufacturer's after-starting checks and inspections and operate the engine generator-set at no load until the output voltage and frequency stabilize. Monitor the temporarily installed temperature gauges.

If temperature reading exceeds the value for an alarm condition, activate the manual emergency stop switch.

- f. Immerse the elements in a vessel containing controlled-temperature hot oil and record the temperature at which the pre-high alarm activates and the temperature at which the engine shuts down. Remove the temporary temperature gauges and reinstall the temperature sensors on the engine.
- g. Remove the high and pre-high coolant temperature sensing elements from the engine and temporarily seal their normal location on the engine and temporarily install temperature gauges in their normal locations on the engine (required for safety, not for recorded data). Where necessary provide temporary wiring harness to connect the sensing elements to their permanent electrical leads.
- h. Start the engine, record the starting time, make and record engine manufacturer's after-starting checks and inspections and operate the engine generator-set at no load until the output voltage and frequency stabilize.
- i. Immerse the elements in a vessel containing controlled-temperature hot oil and record the temperature at which the pre-high alarm activates and the temperature at which the engine shuts down. Remove the temporary temperature gauges and reinstall the temperature sensors on the engine.
- j. Start the engine, record the starting time, make and record engine manufacturer's after-starting checks and inspections during a reasonable warm-up period.
- k. Operate the engine generator-set for at least 30 minutes at 100 percent of service load.
- l. Verify proper operation of the governor and voltage regulator.
- m. Verify proper operation and set points of gauges and instruments.
- n. Verify proper operation of ancillary equipment.
- o. Manually adjust the governor to increase engine speed past the over-speed limit. Record the RPM at which the engine shuts down.

- p. Start the engine, record the starting time, make and record engine manufacturer's after-starting checks and inspections and operate the engine generator-set for at least 15 minutes at 75 percent of rated load.
- q. Manually fill the day tank to a level above the overfill limit. Record the level at which the overfill alarm sounds. Verify shutdown of the fuel transfer pump. Drain the day tank down below the overfill limit.
- r. Shut down the engine. Remove the time-delay low lube oil pressure alarm bypass and try to start the engine. Record the results.
- s. Attach a manifold to the engine oil system (at the oil sensor pressure port) that contains a shutoff valve in series with a connection for the engine's oil pressure sensor followed by an oil pressure gauge ending with a bleed valve. The engine's oil pressure sensor shall be moved from the engine to the manifold and its normal location on the engine temporarily sealed. The manifold shutoff valve shall be open and bleed valve closed.
- t. Start the engine, record the starting time, make and record all engine manufacturer's after-starting checks and inspections and operate the engine generator-set for at least 15 minutes at 75 percent of service load.
- u. Close the manifold shutoff valve. Slowly allow the pressure in the manifold to bleed off through the bleed valve while watching the pressure gauge. Record the pressure at which the engine shuts down. Catch oil spillage from the bleed valve in a container. Add the oil from the container back to the engine, remove the manifold, and reinstall the engine's oil pressure sensor on the engine.
- v. Start the engine, record the starting time, make and record all engine manufacturer's after-starting checks and inspections and operate the engine generator-set for at least 15 minutes at 100% of service load. Record the maximum sound level in each frequency band at a distance of 22.9 m ((75 feet)) from the end of the exhaust and air intake piping directly along the path of intake and discharge horizontal piping; or at a radius of [_____] [22.9 m] [10.7 m] ([75] [35] feet) from the engine at 45 degrees apart in all directions for vertical piping. The measurements should comply with the paragraph SOUND LIMITATIONS. [If a sound limiting enclosure is

provided, the enclosure, the muffler, and intake silencer shall be modified or replaced as required to meet the sound requirements contained within this specification.] [If a sound limiting enclosure is not provided, the muffler and air intake silencer shall be modified or replaced as required to meet the sound limitations of this specification. If the sound limitations cannot be obtained by modifying or replacing the muffler and air intact silencer, the contractor shall notify the Contracting Officer and provide a recommendation for meeting the sound limitations.]

- w. Manually drain off fuel slowly from the day tank to empty it to below the low fuel level limit and record the level at which the audible alarm sounds. Add fuel back to the day tank to fill it above low-level alarm limits.

3.5.5 Performance Tests

3.5.5.1 Continuous Engine Load Run Test

The engine-generator set and ancillary systems shall be tested at service load to: demonstrate durability; verify that heat of extended operation does not adversely affect or cause failure in any part of the system; and check all parts of the system. If the engine load run test is interrupted for any reason, the entire test shall be repeated. The engine load run test shall be accomplished principally during daylight hours, with an average ambient temperature of 35 degrees C, during the month of July. After each change in load in the following test, measure the vibration at the end bearings (front and back of engine, outboard end of generator) in the horizontal, vertical, and axial directions. Verify that the vibration is within the allowable range. Measurements are to be recorded after stabilization of an engine-generator set parameter (voltage, frequency, current, temperature, etc.). Stabilization is considered to have occurred when measurements are maintained within the specified bandwidths or tolerances, for a minimum of four consecutive readings. Data taken at 15 minutes intervals shall include the following:

- a. Electrical: Output amperes, voltage, real and reactive power, power factor, frequency.
- b. Pressure: Lube-oil.
- c. Temperature: Coolant.
Lube-oil.

Ambient.

- (1) Perform and record engine manufacturer's recommended pre-starting checks and inspections. Include as a minimum checking of coolant fluid, fuel, and lube-oil levels.
- (2) Start the engine; make and record engine manufacturer's after-starting checks and inspections during a reasonable warm-up period.
- (3) Operate the engine generator-set for at least 2 hours at 75 percent of service load.
- (4) Increase load to 100% of service load and operate the engine generator-set for at least 2 hours.
- (5) Remove load from the engine-generator set.

3.5.5.2 Load Acceptance Test

Engine manufacturer's recommended pre-starting checks and inspections shall be performed and recorded. The engine shall be started, and engine manufacturer's after-starting checks and inspections made and recorded during a reasonable warm-up period. For the following steps, the output line-line and line-neutral voltages and frequency shall be recorded after performing each step instruction (after stabilization of voltage and frequency). Stabilization is considered to have occurred when measurements are maintained within the specified bandwidths or tolerances, for a minimum of four consecutive readings.

- a. Apply load in steps no larger than the Maximum Step Load. Increase to load the engine-generator set to 100 of Service Load.
- b. Verify that the engine-generator set responds to the load addition and that the output voltage returns to and stabilizes within the rated bandwidths.

3.5.6 Automatic Operation Tests for Stand-Alone Operation

The automatic loading system shall be tested to demonstrate automatic starting, and loading and unloading of each engine-generator set. The loads for this test shall utilize the actual loads to be served, and the loading sequence shall be the indicated sequence. Perform this test for a minimum of two

successive, successful tests. This test shall be for a period of 2 hours. Data taken shall include the following:

- a. Ambient temperature (at 15 minute intervals).
- b. Generator output current (before and after load changes).
- c. Generator output voltage (before and after load changes).
- d. Generator output frequency (before and after load changes.)
 - 1. Initiate loss of the primary power source and verify automatic sequence of operation.
 - 2. Restore the primary power source and verify sequence of operation.
 - 3. Verify resetting of controls to normal.

3.6 FINAL INSPECTION AND TESTING

During final inspection and testing procedures, Fort Campbell Public Works Business Center, Authority Having Jurisdiction shall be scheduled and in attendance. Approval shall not occur without this observation and participation. Testing procedures shall include the following:

- a. Start the engine, record the starting time, make and record all engine manufacturer's after-starting checks and inspections during a reasonable warm-up period.
- b. Increase the load in steps no greater than the maximum step load increase to 100% of service load, and operate the engine-generator set for at least 30 minutes. Measure the vibration at the end bearings (front and back of engine, outboard end of generator) in the horizontal, vertical, and axial directions. Verify that the vibration is within the same range as previous measurements and is within the required range.
- c. Remove load and shut down the engine-generator set after the recommended cool down period. Perform the pre-test inspections and take necessary corrective actions.
- d. Remove the lube oil filter and have the oil and filter examined by the engine manufacturer for excessive metal, abrasive foreign particles, etc. Any corrective action

shall be verified for effectiveness by running the engine for 4 hours at service load, then re-examining the oil and filter.

- e. Remove the fuel filter and examine the filter for trash, abrasive foreign particles, etc.
- f. Visually inspect and check engine and generator mounting bolts for tightness and visible damage.
- g. Replace air, oil, and fuel filters with new filters.

3.7 MANUFACTURER'S FIELD SERVICE

3.7.1 Onsite Training

The Contractor shall conduct training course for Fort Campbell Authority Having Jurisdiction and operating staff as designated by the Contracting Officer. The training period shall consist of a total 4 hours of normal working time and shall start after the system is functionally completed but prior to final acceptance. The course instructions shall cover pertinent points involved in operating, starting, stopping, programming of all components, servicing the equipment, as well as all major elements of the operation and maintenance manuals. Additionally, the course instructions shall demonstrate all routine maintenance operations such as oil change, oil filter change, and air filter change.

3.7.2 Manufacturer's Representative

The engine generator-set manufacturer shall furnish a factory certified, qualified representative to supervise the installation of the engine generator-set, assist in the performance of the onsite tests, and instruct personnel as to the operational and maintenance features of the equipment.

3.8 INSTRUCTIONS

Two sets of instructions shall be typed and framed under weatherproof laminated plastic, and posted side-by-side where directed before acceptance. First set of instructions shall include a one-line diagram, wiring and control diagrams and a complete layout of the system. Second set of instructions shall include the condensed operating instructions describing manufacturer's pre-start checklist and precautions; start procedures for test-mode, manual-start mode, and automatic-start mode (as applicable); running checks, procedures, and precautions; and shutdown procedures, checks, and precautions.

Instructions shall include procedures for interrelated equipment and automatic transfer switches

3.9 **ACCEPTANCE**

Final acceptance of the engine-generator set will not be given until the Contractor has successfully completed all tests and after all defects in installation material or operation have been corrected.

-- End Of Section --

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CHAPTER 3

Division 16000

Technical Requirements and Instructions

SECTION 16700+
Telecommunications Systems

Ft. Campbell Requirements:

General:

The Director of the Information Technology Business Center (ITBC) will enforce the following standards for Installation Information Infrastructure Policy (I3P).

- ITBC will review and approve all proposed voice-data communications requirements for fiber, copper, and all requirements for connectivity into Fort Campbell's telecommunications infrastructure.
- ITBC requires all contracts performing telecommunications construction or deconstruction by a civilian contractor utilize the I3P standard requirements. Any and all requirements in these standards apply equally to on-site employees and to US Government contractors.
- ITBC requires designers to coordinate with tenant organizations and ensure that all communications requirements are being met in accordance with this standard.

Contractor Requirements:

- Application to Dig or Connect Buildings: Project plans and specification shall require Contractors to apply to the Director, Information Technology Business Center for approval of a digging/excavation permit. The Contractor is required to contact the ITBC as required in the I3P prior to connecting any building on Fort Campbell to the infrastructure.
- Plans and specification shall require Contractors to notify the ITBC when renovating, modifying, or deconstructing communications materials in any existing structures on Fort Campbell, KY. This also applies to new facilities or any Major Construction Projects (MCA) at Fort Campbell, KY.

Other:

- Per DAIM-FD Memorandum dated 3 November 2000, Army-wide policy applies to individual subscriber communications (barracks soldier rooms) infrastructure that supports MILCON barracks construction. Project funds are allowable to install the cabling from the individual soldier room to a central telephone closet. Beyond that point, AAFES through their commercial phone service provider, will make connection.

- All infrastructure exterior communications infrastructure to the designated central closet is the responsibility of AAFES through their designated service provider. This includes all outside cable plant (cable, duct, manholes), equipment shelters, and switches.

Instructions to Designers:

Design Requirements:

1. All detailed requirements contained in the [Fort Campbell Installation Information Infrastructure Policy \(I3P\)](#) document shall be incorporated into all design and construction documents. Any additional requirements not addressed in the document standards will conform to the ANSI/TIA/EIA Standard.
2. All Designs shall be coordinated with ITBC and submitted to ITBC for review and approval prior to start of construction to ensure that the requested or designed wiring is available in the existing system infrastructure.
3. All new data and voice communications lines shall be installed underground. If and when overhead service has been approved by the installation, use pinless construction. Should a need for cross arms arise, use fiberglass. Wooden poles with wooden cross arms are NOT to be utilized.

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APPENDIX H [NEW]

Directorate of Information Management Installation Information Infrastructure Policy (IIIP)

Standards For

Cable Distribution Systems (CDS), Inside Cable Distribution Systems (ICDS) And Cabling Systems Located on U. S. Government Owned Facilities

Prepared By:
DOIM
907 Bastogne Ave
Fort Campbell, KY 42223

Revised
9 March 2005

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I.

PURPOSE

The purpose of this document is to stipulate the Directorate of Information Management (DOIM) requirements for information infrastructure for outside Cable Distribution Systems (CDS), Inside Cable Distributions Systems (ICDS) and other cabling systems within and between facilities and buildings that are supported by the DOIM, Fort Campbell, KY.

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II.

APPLICABILITY

This policy applies to all units, activities, and tenants assigned or attached to Fort Campbell, Kentucky. It also applies to all contractors and subcontractors performing work on this installation.

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III.

Chapter 1 Responsibilities

SECTION I – Director of Information Management (DOIM)

1.1 Enforcement

1.1.1 Enforce the Installation Information Transfer System (IITS) Practical Engineering Design Guide.

1.1.2 Review and approve all proposed communication/automation requirements for fiber, copper, and all requirements for connectivity into Fort Campbell's Telecommunication/Automation infrastructure.

1.1.3 Ensure all contracts for performing telecommunications/automation functions by a civilian contractor utilize this policy. Any and all references in this policy to on-site employees, installation personnel, or other similar terms apply equally to U. S. Government contractors.

1.1.4 Coordinate with tenant organizations to ensure all telecommunications requirements are being met in accordance with this policy. This includes construction of any new facility or facilities or any Major Construction Projects (MCA) at Fort Campbell, Kentucky.

Section II - Contractors

1.2 Apply to the Director of Information Management for approval of a digging permit.

1.2.1 Contact DOIM Plans Section prior to:

- a. Connecting any building on Fort Campbell, Kentucky to the infrastructure.
- b. Renovating an existing building on Fort Campbell, Kentucky.
- c. Construction of any new building(s).

1.2.3 Adhere to Installation Information Infrastructure Standards at enclosure 1.

Section III – Unit/Activity Information Management Officers (IMOs)

1.3 Unit/Activity Information Management Officer (IMO) or alternate(s) IMO will –

1.3.1 Submit a work order to DOIM, Building 907, Bastogne Avenue, for any requirements for connectivity on changes to the Fort Campbell telecommunications/automation infrastructure.

1.3.2 Ensure work orders state concise requirements for any new work to be performed, a line drawing must be included to depict work to be accomplished, a building number must be listed and an IMO as POC.

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IV.

Chapter 2 Telecommunications Standards

Section I – Director of Information Management

2.1 Enforcement

2.1.1 Technology

2.1.1.2 The DOIM will enforce the Installation Information Infrastructure Policy (IIIP). Director or his representative will review and approve all proposed communications requirements for fiber, copper, and all requirements for connectivity into Fort Campbell's telecommunications/automation infrastructure. He/they will ensure all contracts for performing telecommunications/automation functions by a civilian contractor use this policy. Any and all references in this policy to on-site employees, installation personnel, or other similar terms apply equally to US Government contractors.

2.1.2 Coordination

2.1.2.1 DOIM, in coordination with tenant organizations shall ensure all communications/automation requirements are being met in accordance with this policy.

Section II – Contractors

2.2 Application to Dig or Connect Buildings

2.2.1 Contractor will apply to the DOIM for approval of a digging permit 10 working days prior to the date of digging. The permit will be valid for 30 days only. The contractor will contact DOIM Plans prior to connecting any building on Ft Campbell, KY to the infrastructure. This can be done at Bldg 907. Fillout a FC Form 4043 with appropriate information and site plans. The site needs to have excavation area predefined and marked prior to site visit of the utility locator. When locates are performed, contractor will hand dig 30 inches on both sides of the mark. A copy of the DOIM Policy Letter on Digging Permits is at Appendix A.

2.2.2 Renovations

2.2.2.1 Contractor will notify DOIM when renovating any existing structure(s) on Fort Campbell, Kentucky. Contractor or sponsoring organization will be responsible in providing DOIM with plans and funding for all renovations or additions prior to start of construction.

2.2.2.2 Contractor or Directorate of Public Works (DPW) will notify DOIM when renovating or adding to any existing structure at Fort Campbell, Kentucky

2.2.2.3 DPW or contractor will notify DOIM prior to building destruction so communications/automation equipment may be removed.

2.3 New Construction

2.3.1 DWP or Contractor will notify DOIM prior to building any new construction that will be connected to the Fort Campbell, Kentucky infrastructure.

Section III – Outlet Box – New Installation

2.3 For standard administrative outlets and hospital outlets use a 2”X4” electrical box installed flush with the wall surface. Dual jacks will be used instead of single jack use. Dual jack will be one voice and one data. NO single jacks will be installed without DOIM approval in writing.

Section IV – Outlet Conduit – New Installation

2.4 For the standard administrative and MEDDAC outlet boxes, use 1” Electrical Metallic Tubing (EMT) from the outlet box to the communications tray system or directly to the communications equipment room.

2.4.1 When using cable tray system and conduit to the cable tray, all conduit must be secured and bonded to the cable tray system. Cable tray system must be bonded and grounded to a common structural ground.

Section V – Face Plates

2.5 For standard administrative and MEDDAC outlets, use a full outlet face plate with locations for all copper cable and, if used, fiber optic cable jacks/connectors; optionally use a single gang outlet face plate installed over a reducing ring with locations for all copper cable, and if used, fiber optic cable jacks/connectors.

Section VI – Outlet Density – New or Renovated

2.6 For planning purposes, when actual outlet locations are not known, an outlet will be planned as follows: Each outlet will contain a minimum of two dedicated pulls of Category 5E Cable; one dedicated for voice and one dedicated for data. Customer requirements may dictate for additional drops to a single location based upon their mission. The minimum number of jacks per building type is as follows with an additional percentage for future growth:

TYPE OF SPACE	QUANTITY
Administrative Space	1 dual jack per 50 sq ft-25% for future growth
Technical Space	1 dual jack per 50 sq ft-25% for future growth
Living Space	1 dual jack per 315 sq ft-25% for future growth
Warehouse/Motor Pool/Hangers	1 dual jack per 1000 sq ft-25% future growth
Other	1 dual jack per 80 sq ft-25% for future growth

A pull string will be installed in the conduit to allow for the future installation of fiber optic cable to each outlet. An optimal fill ratio of 40% will be planned for. Under no circumstances will a ratio of 80% be exceeded.

Section VII – Other – New or Renovated

2.7 Distribution systems using “D” rings or “J” hooks will not be installed as these systems do not properly support and protect the cable. Exception to this policy will be evaluated and approved on a case by case basis by the DOIM Plans section. See Appendix B for cabling support.

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V.

Chapter 3 Special Requirements

Section I – Phone/Fax Outlets – New or Renovated

3.1 When an outlet is specifically identified for a telephone or fax/modem connection, a dual jack outlet will be connected with two 4-pair category 5E cable installed from the telecommunication CER to the outlet.

Section II – Cable Television – New or Renovated

3.2 When cable television requirements are identified, either a broadband coaxial cable or single mode fiber optic cable system may be installed. A separate backboard is required to keep cable television cable off of the telephone backboard. If a coaxial system is installed, care must be taken to insure the correct cable is used given the distance requirements. The following is a list of the cable type and its corresponding distance limitations.

<u>Cable</u>	<u>Distance</u>
RG-59	150 feet
RG-6	250 feet
RG-11	400 feet

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VI.

Chapter 4 Building Infrastructure

Section I – Cable Tray – New or Renovated

4.1 Solid bottom cable tray will be used to provide a centralized cable management/distribution system. Provide a cable tray with one square-inch of cross-sectional area per outlet location to be served. (For 22 outlets, a 9" x 4" = 36" square cable tray would be satisfactory.) During actual design, an optimal fill ratio of 40% will be planned. Under no circumstances will a ratio of 60% be exceeded. Ladder cable tray will never be used with communications system cables because they do not adequately support fiber optic cables. Ladder tray provided point stress to fiber optic cable leading to fiber micro-bends and fractures.

Section II – Enclosed Duct – New or Renovated

4.2 If the building design does not provide for the installation of cable tray, enclosed square duct may be installed instead. Duct may also be used in place of cable tray in the installation of secure cabling systems. For initial design guidance, provide one square inch of cross-sectional area of the enclosed duct per outlet location. During actual design, an optimal fill ratio of 40% will be planned, Under no circumstances will a ratio of 60% be exceeded.

Section III – Conduit – New or Renovated

4.3 Whether cable tray or enclosed duct is used to each outlet, conduit for standard dual jack outlets will be a minimum of 1" EMT conduit. If a cable tray or enclosed duct is not used due to low outlet count, individual conduits will be installed from the telecommunications CER to each outlet. Where fiber optic cable is not initially installed to the standard dual jack outlets, a full-line will be installed along with the wiring.

Section IV – Data Riser – New or Renovated

4.4 Twelve (12) strand single mode fiber optic cable will be installed between the main telecommunications equipment room and each telecommunications CER. The data fiber optic cable will be terminated in a 110 patch panel installed in the equipment rack or cabinet

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VII.

Chapter 5 Communications Equipment Room (CER)

Section I - Size

5.1 Communications Equipment Room (CER) (APPENDIX A) will be sized in accordance with EIA/TIA 569 for buildings with a primarily administrative function. Under no circumstances will a CER smaller than 70 sq. ft. (7' x 10') be used. Generally, the CER will be sized approximately 1% of the area to be serviced. For example, a 10,000 sq. ft. area will be serviced by a minimum of a 100 square foot CER. All CER doors will open out, to allow maximum interior CER space utilization. All CERs will be laid out in accordance with the DOIM standard CER design and any deviation will be approved by DOIM.

Section II - Location

5.2 Communication Equipment Rooms (APPENDIX A) will be dedicated spaces not shared with other functions (i.e., electrical rooms, mechanical rooms, etc.). CERs will be located centrally as possible to ensure that maximum cable distance to an outlet will not exceed 100 meters (300 feet). Rooms containing transformers, air handling unit, etc., will be avoided if at all possible. All CERs will be lockable to limit access. CERs will be keyed separate from the Building master and turned over to DOIM.

Section III - Multi-Story Buildings

5.3 In multi-story buildings, a minimum of one CER will be located on each floor (small facilities - i.e., air traffic control towers - may use one CER for the entire facility). The CERs will be vertically stacked directly above each other wherever possible. A minimum of three (3) 4" conduits will be installed between the main CER and each secondary CER, in accordance with EIA/TIA 569.

Section IV - Climate Control

5.4 Each CER will be temperature controlled, when specified, to protect all installed equipment.

Section V - CER Contaminants

5.5 Information system equipment will not be installed in spaces where dust, moisture, liquid, or gaseous spillage, or other contaminants may be present

Section VI - Copper Termination

Type Category 5E compliant termination panels mounted in 19" racks with organizers. Voice cabling will be terminated on 66 blocks with brackets and data on 110 blocks on backboard unless specified by DOIM for rack installation. DOIM will make final determination on this issue. Distribution field will be established to organize jumpers and associated wiring on communications backboards. When copper is terminated or spliced with new cable, a 0% tolerance will be accepted.

Section VII - Copper Data Patch Cables

5.8 Data patch cables will be four pair, stranded, 24 AWG, category 5E cable factory assembled. Contractor will furnish DOIM with Jumpers for each LAN port installed. Jumper will be Category 5E and 6ft in length.

Section VIII - Fiber Optic Termination

5.9 All distribution (horizontal or workstation) fiber optic cable (FOC) will be terminated in rack mounted patch panels. Diagram of Standard Rack at APPENDIX E. Duplex patch cables will be used. Where required, all fiber optic cable will be terminated in an enclosed 19" cabinet to provide greater protection for terminations, data equipment and patching.

Section IX - Power

5.10 A minimum of four dedicated 20 ampere, 110 volt AC outlets will be installed with each equipment rack or cabinet to provide power for installed equipment. Additional outlets will be installed on each wall in the CER. Each Communications Rack will have a 1000 VA UPS installed.

Section X - Grounding

5.11 All CERs will be connected to a single point building ground in accordance with EIA/TIA 607.

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VIII.

Chapter 6 Riser Cable

Section I - Voice Riser

6.1 Multi-pair voice riser cable will meet the requirements of ICEA S-80-576 and ELVTIA 568-A for Category 5E, unshielded twisted pair cable. Conductors will be solid untinned copper 24 AWG. Plan for termination of riser cable and type of hardware will be submitted to DOIM Plans for approval prior to installation. Provide at least two cable pairs within the riser cable for each outlet connected to the CER served by the riser cable. Cable jackets will conform to the color code for the faceplate inserts as per Section IX.

Section II - Copper Jacks

6.2 Copper jacks will be EIA/TIA Category V, 9-pin/8 position insulation displacement terminations wired per T568A (normal) or T568B (if part of an existing system).

Section III - Fiber Optic Connectors

6.3 Fiber optic connectors will be "ST" type.

Section IV - Copper Cable

6.5 Two 4-pair, 24 AWG, 100 ohm. Category 5E, solid unshielded twisted pair (TUF) cables will be installed to each standard dual jack outlet and one 4-pair, 24 AWG, 100 ohm. Category 5E, solid, UPT cable will be installed to each single jack outlet identified in paragraph Ia above. Use only cable that has passed the UL LAN Cable Certification Program, and is labeled with the UL acceptable markings. Termination will be performed using an eight pin (RJ45 type) jack. All terminations will be wired in accordance with the pin configuration for IEA/TIA T568A. One cable will be designated for voice and one for data. Each voice outlet will be assigned a unique telephone number in accordance with the single line concept. When copper is terminated or spliced, there will be a 0% tolerance with new cable.

Section V - Fiber Optic Cable

6.6 Fiber optic cable (FOC) to each outlet is optional. At a minimum, outlets and faceplates will be sized to allow for the future installation of two strands of FOC. If FOC is required, single mode fiber will be installed using "ST" type connectors.

Section VI - Pull Line

6.7 All conduit to the outlets where fiber optic cable is not initially installed will be provided with a pull line.

Section VII - Cable Length

6.8 If the telecommunications CER is centrally located, plan a minimum of 200 feet of cable from the telecommunications CER to each outlet. For a non-centrally located telecommunications closet, adjust the average cable length as required (measure if necessary) for the connection.

SECTION VIII – Wire/Inserts

6.9 All drops will conform to the following wire color scheme –

Beige - Voice

Green – NIPRNet

Red – SIPRNet (Secret)

Orange – JWICS (Top Secret)

All faceplates should be neutral in color, i.e., beige, white, eggshell, ecru, etc.

NOTE: On 1 Jul 05, cable will be level 6 for both data and voice and patch panels will also be level 6. Contractor will provide the DOIM a hard copy of the test results after testing the cable.

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IX.

Chapter 7 Outside Plant/Manhole & Duct

Section I - Placement

7.1 Manholes will be a minimum of 12' long by 6' wide by 7' deep. Distance is based upon the typical length of high pair count cables available on reel. No manhole run will exceed 550' without prior approval from DOIM Plans. Refer to attached diagram for manhole specifications. All pre-cast manholes will have submittals approved by DOIM Plans prior to installation. If an existing manhole is to be entered with duct that does not have ports available, the entrance holes will be core drilled and conduit will have flanged opening into manhole to prevent damage to cable. Diagram at APPENDIX C.

Section II - Cabling

7.2 When computing cable distances, allow sufficient cable for looping around the inside of the manhole for splicing. Recommended allowances are: a minimum of 20' per copper cable for looping around the manhole and for splicing and a minimum of 50' per FOC for a loop in each manhole to allow for future splicing, repair, or termination of cables. Cables will be racked on the walls and supported in the manholes. A 30' maintenance loop for FOC is required inside end user building. When splicing or terminating copper, a 0% tolerance is allowed for new cable.

Section III - Conduit Between Manholes

7.3 Where new duct is required, a minimum of four 4" conduits will be installed. Additional ducts may be installed, as required (look to future growth since it is much more expensive to add additional duct than to install now). One of the ducts will have four 1" innerducts installed for FOC installation. Any unused duct, or innerduct, will have a pull line installed to facilitate future use. All encased and un-encased duct installed between manholes will be buried a minimum of 48" below grade. Diagram at APPENDIX D.

Section IV - Conduit to Buildings

7.4 A minimum of three 4" conduits will be installed to each building. One of the ducts will have four 1" innerducts installed for FOC installation. This allows one for copper cable, one for fiber optic cable, and one spare. Any unused ducts will have a pull cord installed to facilitate future use.

Section V - Concrete Encasement

7.5 Concrete encased duct will be used to protect buried cable under all road/streets or other high surface load situations; additionally, approximately 25 feet of concrete duct will be used on the approaches to the manholes. Concrete encasement should be 3 ½ feet. 6" PDS is required for SIPRNET cable.

Section VI – Boring under railroad tracks

7.6 When boring under railroad tracks or roads, a Standard 80, galvanized steel pipe will be used or else concrete encasement will be necessary.

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X.

Chapter 8 Direct Buried Copper Cable

Section I - Cable

8.1 Rodent protected, gel filled cable with a polyethylene sheath which meets the manufacturing specifications of REA PE-39 or REA PE-89, as appropriate will be installed in all direct burial applications. There will be a metallic ribbon placed in the ditch over the cable to enable the location of said cable. All cable will be buried a minimum of 48" below grade.

Section II - Splices

8.2.1 All cable splicing will be done either in manholes, handholes, or pedestals. No buried splices will be performed.

8.2.2 Perform stainless steel splice cases are Fort Campbell's Standard for all copper cable splices. DOIM requires submittals for splice cases and splice modules prior to work beginning.

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XI.

Chapter 9 Outside Plant Cable

Section I - Voice

9.1 Copper cable will be installed from the Dial Central Office (DCO), or servicing remote switching center or unit (RSC/RSU), to each building for voice transmission. Use existing cable as long as it is capable of providing the required service. Two pair will be allowed for each outlet in the project. Copper cables will be terminated on a composite gas and heat coil protector.

Section II - Data

9.2 A minimum of 12 strands of single mode fiber (FOC) will be installed from the Area Distribution Node (ADN) i.e. local data switch to each end user building for data transmission. Higher strand count (24 strands for 500 people or less, 48 strands for over 500 people served) can be installed from the DCO to an ADN, with twelve (12) strands installed from the ADN to each end user building. Building occupancy/usage will be taken into consideration when planning the FOC outside cable plant and additional strands of FOC will be installed as required.

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XII.

Chapter 10 SIPRNET Requirements - Cable

Section I – Cable installation

10.1 Cable installation involving SIPRNet connectability will meet these requirements – (1) Parallel cabling will be a minimum of 39” distance between NIPRNet/Voice and SIPRNet cables; (2) All non-shielded cables will be installed in ferrous conduit using elbows, couplings, nipples, and connectors of the same material; (3) All connectors will be permanently sealed completely around all surface; and (4) SIPRNet color coding will be established by the local Information Assurance Manager at 798-7448; (5) All conduit will be connected to a common building ground for conduits runs up to 100 feet will be grounded with a #10 AWG green protective cover and more than 100 feet will be #8 AWG, (6) SIPRNet conduit and faceplates will be marked each 6 to 10 feet using Standard Form 707 (Secret).

Section II – Communications Equipment Room Door

10.2 The doorway will be one door with a 40” width opening. Two entry locks are required. One lock will be a keyed dead bolt lock with a minimum bolt length from door to frame of 1”. The second lock will be a combination lock and meet the specification of an X09 security locking device.

Section III – SIPRNet Approval

10.3 SIPRNet circuits will be approved by Information Assurance Manager prior to installation. User will call the help desk at DOIM, 798-9300.

Section IV – ICIDS Requirement

10.4 Installation of ICIDS Equipment for a Communications Equipment Room (CER):

- All monies will be MIPRd to PSBC Alarm Administrator Account Manager for installation of ICIDS.
- Modify specifications to insure Contractor will provide all materials (excluding the RADC, Keypad, LED indicator lamp, and sensors)
- Modify specifications to insure Contractor will schedule a meeting with the Alarm Administrator prior to commencement of work (270) 798-3990/1225/7587 Note: Type & placement of sensors will be noted at meeting.

10.4.1 Mount the Remote Area Data Collector (RADC) to the same side as the interior door opens, approximately two feet to the left or right of the door and five feet up from the floor. (Physical Security office will provide the RADC.)

10.4.2 Mount a four square box to the left or right of door as in step one approximately one foot from the doorframe and five feet up from the floor. Half inch EMT must be run from the four square box to the bottom of the RADC can. This is for the mounting the Keypad. (Physical Security will provide and install the keypad.)

10.4.3 A foursquare must be mounted to the ceiling (center) of the CER or rear wall facing the door depending on the type of motion sensor to be used. Half inch EMT must be run from the foursquare to the RADC can (top). Note: Placement of sensors will be noted at time of meeting. (Physical Security will provide and install sensors)

10.4.4 Drill a half inch hole approximately eighteen inches above and centered on the CER door to outside for mounting of the LED indicator lamp. (Physical Security will provide and install the LED.) Mount a foursquare box over the drilled hole and run half inch EMT from box to the RADC can (top).

10.4.5 Dedicated 120 VAC power must be run to the RADC can through ½" or ¾" EMT.

10.4.6 A dedicated phone line must also be run to the RADC can. This wire can be run using the conduit from either sensor.

10.4.7 A four conductor 22 AWG wire must be run from motion sensor to the RADC.

10.4.8 A two conductor 22 AWG wire must be run from foursquare above CER door to the RADC. This is for the Balanced Magnetic Switch (BMS) for the door. (Physical Security will provide and install the BMS.)

10.4.9 A two conductor 22 AWG wire must be run from the foursquare above door to the foursquare for the keypad installation. This is for the LED indicator to be mounted on the outside of the CER.

10.4.10 A two conductor 22 AWG wire must be run from the foursquare, for the keypad, to the RADC.

10.4.11 A two conductor shielded 24 AWG wire must be run from the foursquare for the keypad to the RADC.

NOTE: Leave approximately four feet of wire at both ends.

Conductors for ICIDS Equipment for CER:

10.4.12 Signal wiring: Type of wire to be used (another manufacturer's wire, of equal quality, can be substituted).

West Penn 220 = 2 conductor 22 AWG
West Penn 240 = 4 conductor 22 AWG
West Penn 2401 = 2 conductor, 24 AWG, shielded

Power wiring: Black, Red, Green- 12 AWG, stranded, to RADC.

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APPENDIX A

AFZB-IT

7 February 2005

MEMORANDUM FOR RECORD

SUBJECT: Policy #1 – DOIM/Customer Responsibility for Digging Permits for Communication/Data Infrastructure

1. References:

- a. FC Form 4043 (Rev), July 2004, Digging Permit, Part I.
- b. IMO/TSO Handbook located on the Intranet dtd 30 Apr 2001

2. Purpose: To provide the DOIM Policy concerning marking DOIM infrastructure for digging purposes, which includes marking for contractors and housing residents.

3. Applicability: This policy applies to all persons wishing to dig at Ft. Campbell, KY to include installation of satellite dishes, excavation, fencing, etc..

4. Policy: The FC Form 4043 is provided for customers who require digging of any type on the installation. The form is a proponent of PWBC, but DOIM has portion of the cable marking for communication/data. We therefore have instituted this policy to cover DOIM's portion ONLY. The following items apply:

- a. The digging permit expires after a 30 day period. The customer should come back to the DOIM in Building 907 to have the permit revalidated and the cable locations remarked.

- b. The digging permit will be on the job site at all times. If the permit is not available when questioned by DOIM personnel, all digging will stop until said permit is in place at job site.

- c. If cable location markings become unreadable or washed away, the DOIM will be contacted immediately and the locations will be remarked. Do not try to GUESS where the marks were, we will remark as many times as necessary to prevent costly cable cuts.

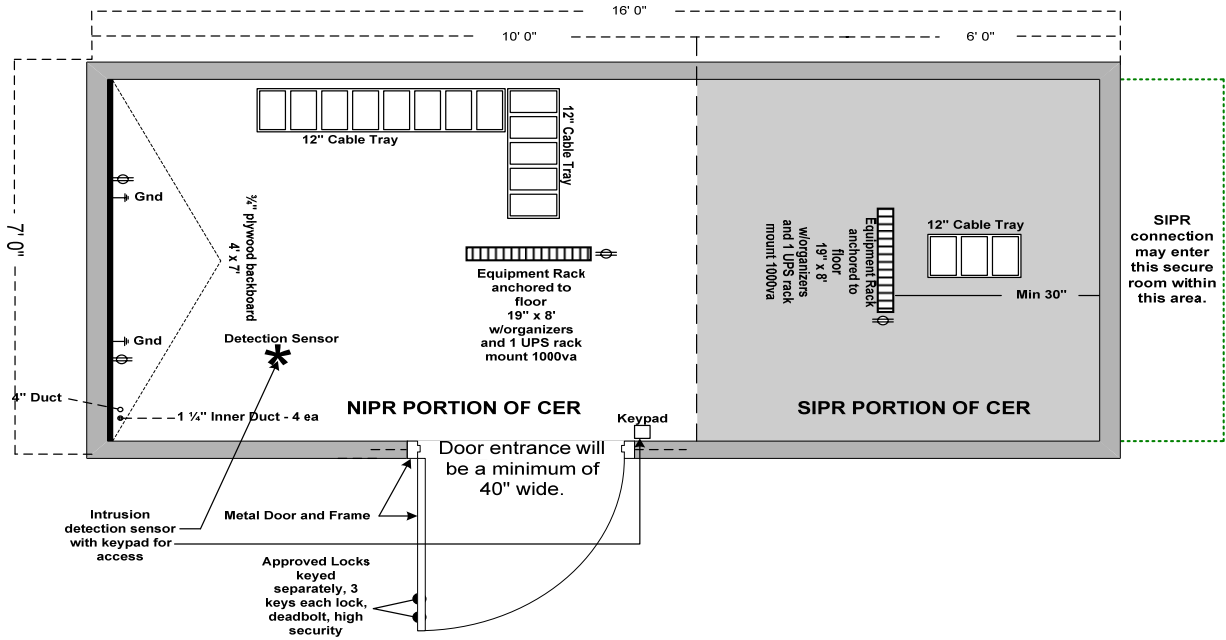
It is the responsibility of the DOIM to protect the communication/data infrastructure and this policy will help meet that mission requirement.

6. If you need further clarification contact the Chief, Telecommunications, DOIM, at 798-9999.

JAMES O. WEBB
Director, DOIM

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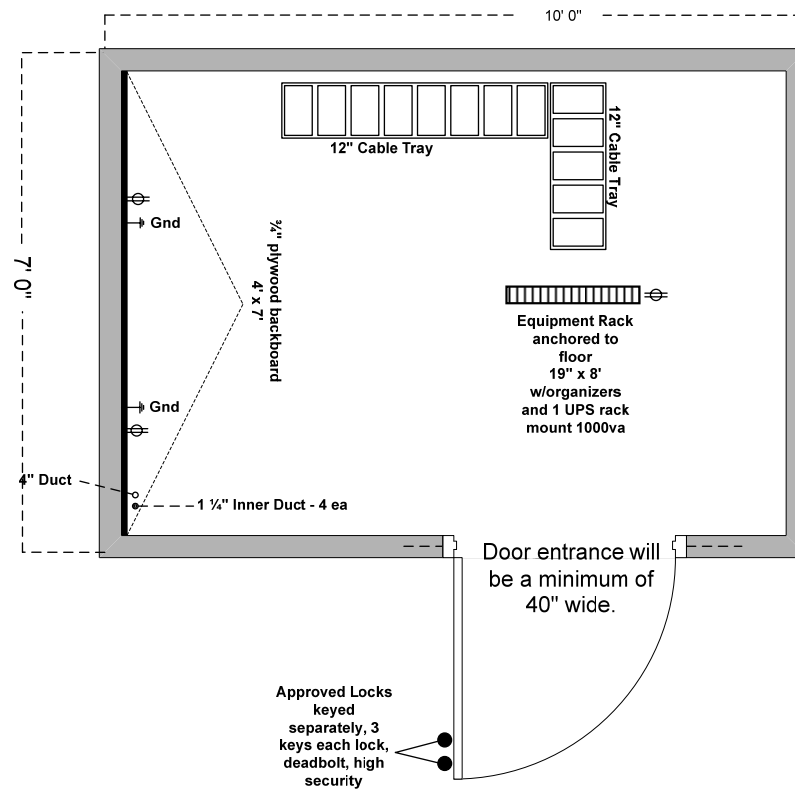
APPENDIX B



Depicts common CER for Brigade, Battalion, and Company Operations areas.

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APPENDIX C

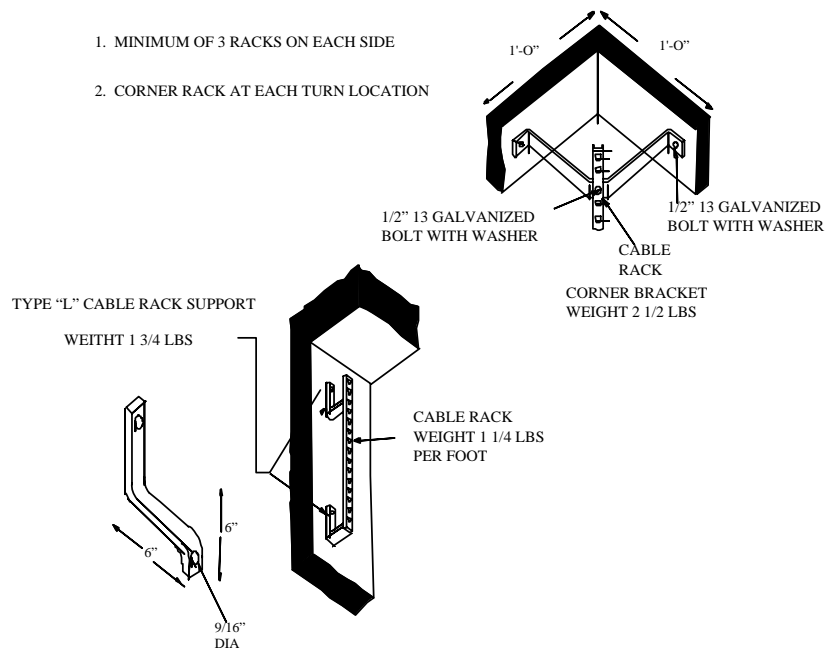


Depicts Motor Pool, Dining Facility and other operational areas.

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APPENDIX D

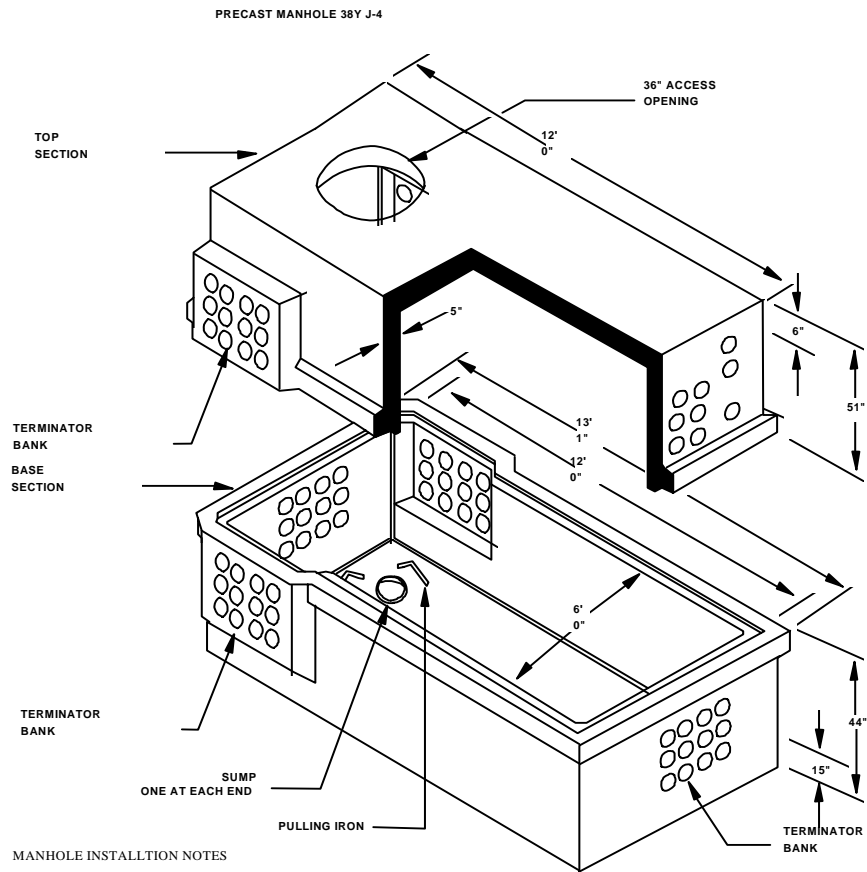
TYPICAL TELEPHONE CABLE RACKS



Depicts Telephone Cable Rack Instructions.

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APPENDIX E



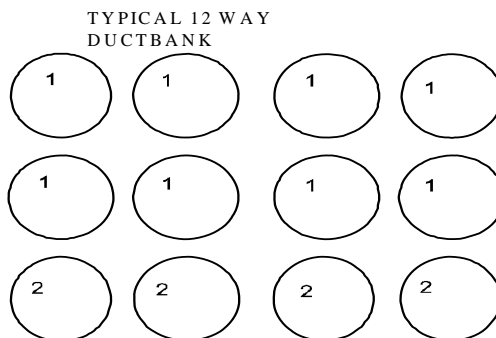
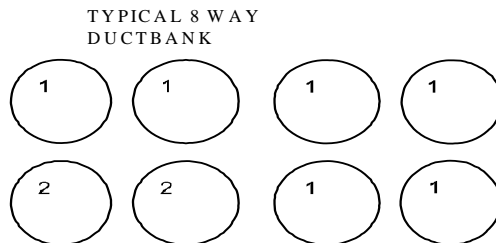
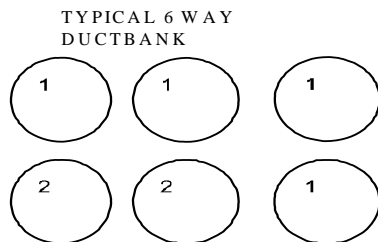
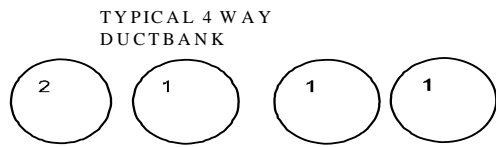
MANHOLE INSTALLTION NOTES

1. REQUIRED SIZE 12' X 6' X 7' (38Y-J4)
2. COORDINATE EXACT PLACEMENT OF MANHOLES WITH DOIM, (910) 396-8200/2908
3. MAXIMUM DISTANCE BETWEEN MANHOLES SHALL NOT EXCEED 600 FEET
4. CONCRETE ENFORCE ALL MANHOLE COLLARS PLACED IN ROADWAYS OR PARKING AREAS
5. PLACE MANHOLE A MINIMUM OF 12" DEPTH BELOW GROUND LEVEL AND A MAXIMUM OF 24" BELOW GROUND LEVEL.
6. GROUND ROD WILL BE PLACE IN THE REAR CORNER OF MANHOLE OPPOSITE THE SIDE TERMINATOR.
7. PLACE MANHOLES NEAR INTERSECTION WHERE POSSIBLE.
8. CONCRETE ENCASE ALL 45/90 DEGREE SWEEPS.
9. PULLING IRONS REQUIRED FOR EACH WALL.
10. CABLE RACKS INSTALLED FOR THE ENTIRE LENGTH OF MANHOLE

Depicts requirements for precast manhole.

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APPENDIX F



PVC INSTALLATION NOTES

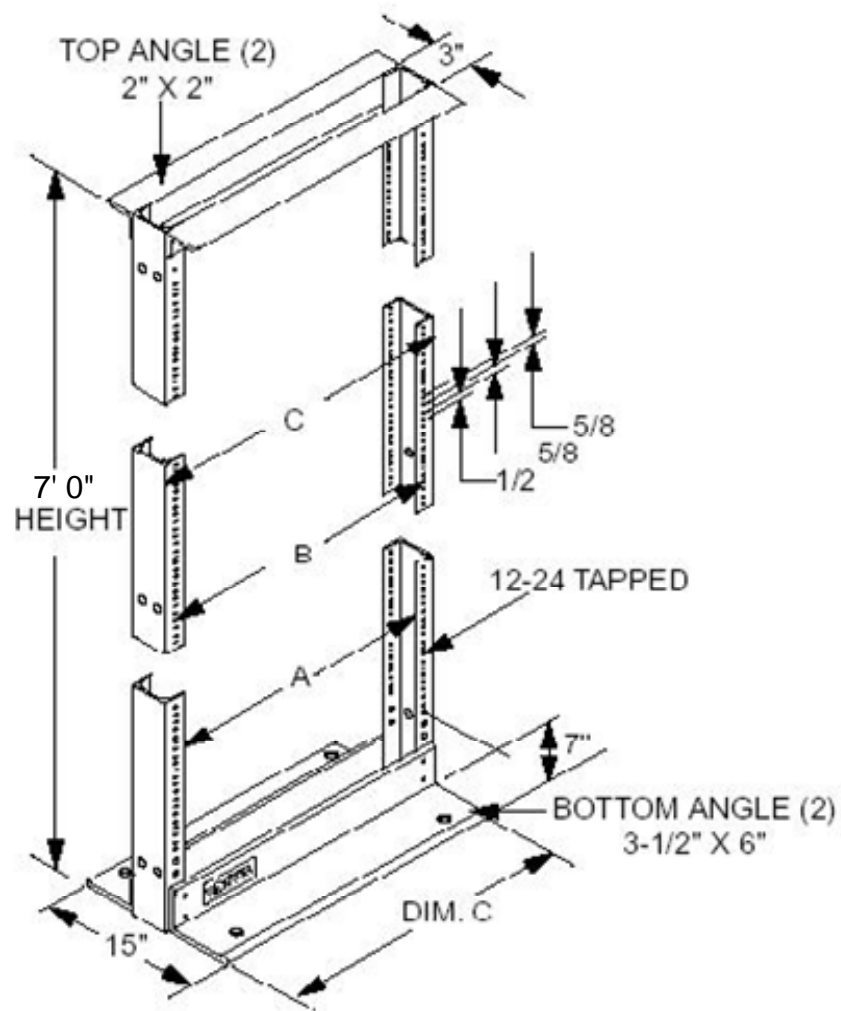
1. MINIMUM 36" DEPTH
2. DUCT WILL ENTER THE MANHOLE AT THE BOTTOM OF TERMINATOR BANK AND IN THE BOTTOM BANK, DUCT PLACEMENT WILL BE CONSISTANT THROUGH THE MANHOLE RUN.
3. CONCRETE ENCASE AT ALL ROAD CROSSINGS , SWEEPS, AND PARKING AREAS.
4. NO MORE THAT A 3 INCH DROP (DEPTH) PER 10 FOOT SECTION.
5. NO MORE THAN ONE (1) 45 OR 90 DEGREE SWEEP PER 10 FOOT SECTION
6. DUCT CLEANING SHALL CONSIST OF A FLEXIBLE MANDREL THAT IS 1/4 INCH LESS THAN INSIDE DIAMETER OF DUCT, 2 WIRE BRUCHES, AND A RAG. THE CLEANING ASSEMBLY SHALL BE PULLED THROUGH CONDUIT A MINIMUM OF 2 TIMES. A PULL STRING WILL BE PROVIDE IN EACH DUCT

LEGEND
1 = 4 INCH PVC
2 = 6 INCH PVC

Figure 5 depicts typical duct work for manholes

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APPENDIX G

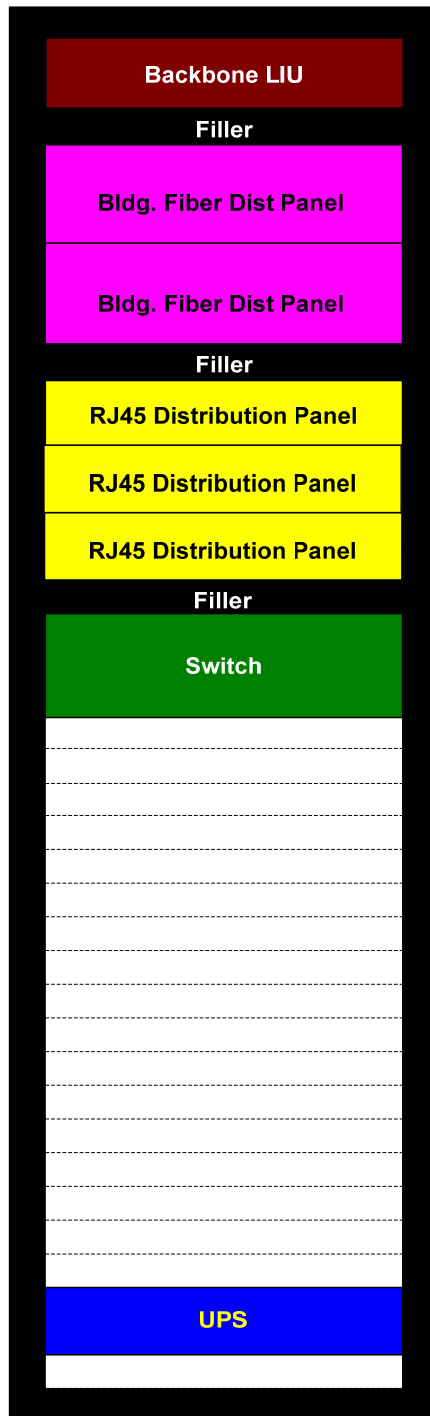


Equipment Rack, Channel Type, Bolted, Double Sided, Free Standing, EIA Universal (5/8" – 5/8" – 1/2") Mounting Spacing

Figure 6 depicts a standard 7'0" high, 19-1/2" wide (to accept standard 19" rack mounted equipment) floor secured rack.

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APPENDIX H



Each rack is to contain two shelves for installation by user.

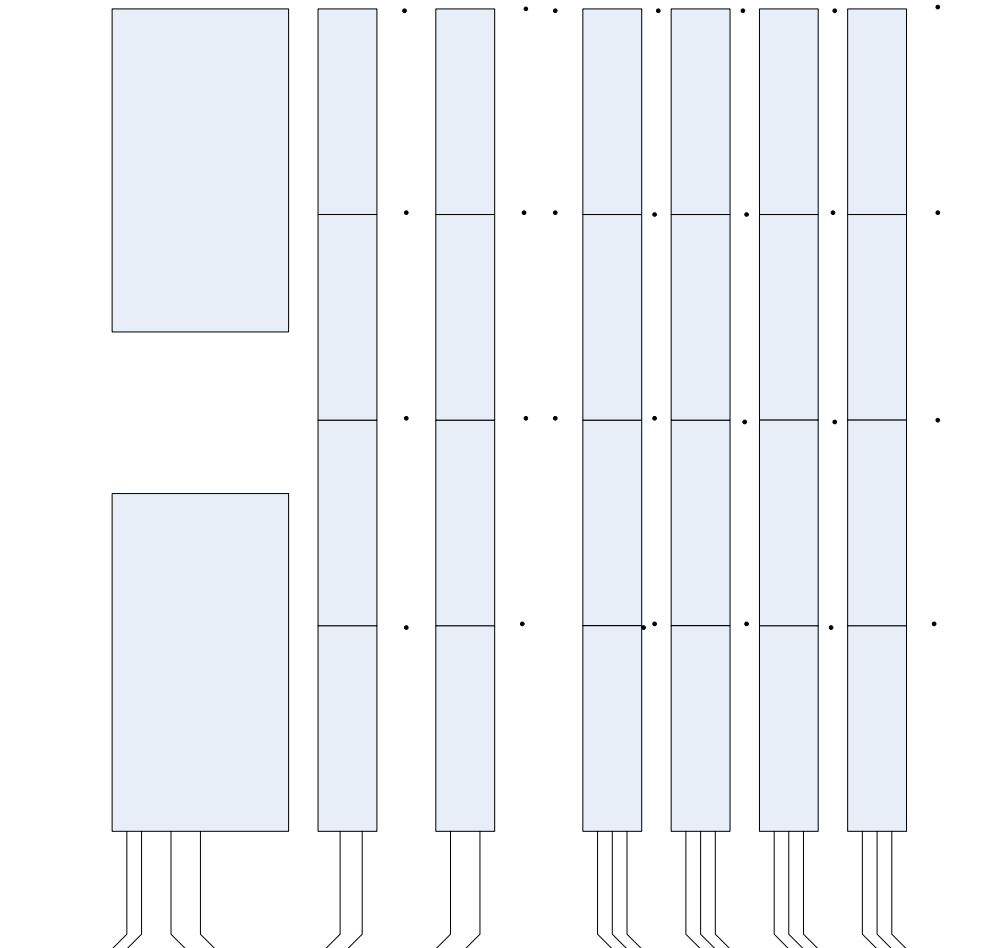
Each rack to come with a wiring and distribution channel, each side.

Depicts a standard 19" rack configuration for the CER.

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APPENDIX I

APPENDIX I



1. Entrance terminals – Mounted at top of backboard on one side and stenciled
2. Entrance Cable/Cables – Clamped to surface of wall and backboard.
3. Cable Pair Feeders from Terminals – Clamped to surface of wall and backboard. (Not run through distribution rings). Terminated on left side of 66M1-50 blocks.
4. Distribution Rings – Install across bottom of backboard and positioned so jumpers are run with 90 degree turns.
5. Distribution Cables/Station Wiring – Clamped to surface of wall and backboard. (Not run through distribution rings). Terminated on both sides of 66M1-50 blocks.
6. Connector Blocks with Mounting Brackets – Blocks, 66M1-50s. Brackets, 89Bs. Install vertical rows of four per row with 4 inches between rows and three inches down from top of backboard.
7. Distribution Posts – Install centered 1 ¾ inches from left and right of top of 66M1-50 block.

Backboard – Mounted 34 inches above floor. All cross connects run through distribution rings and over distribution posts with a finger loop. Bridge with bridging clips at the DCO end.

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APPENDIX J

ACRONYMS:

Cable Distribution System (CDS)

Inside Cable Distribution Systems (ICDS)

End of Document

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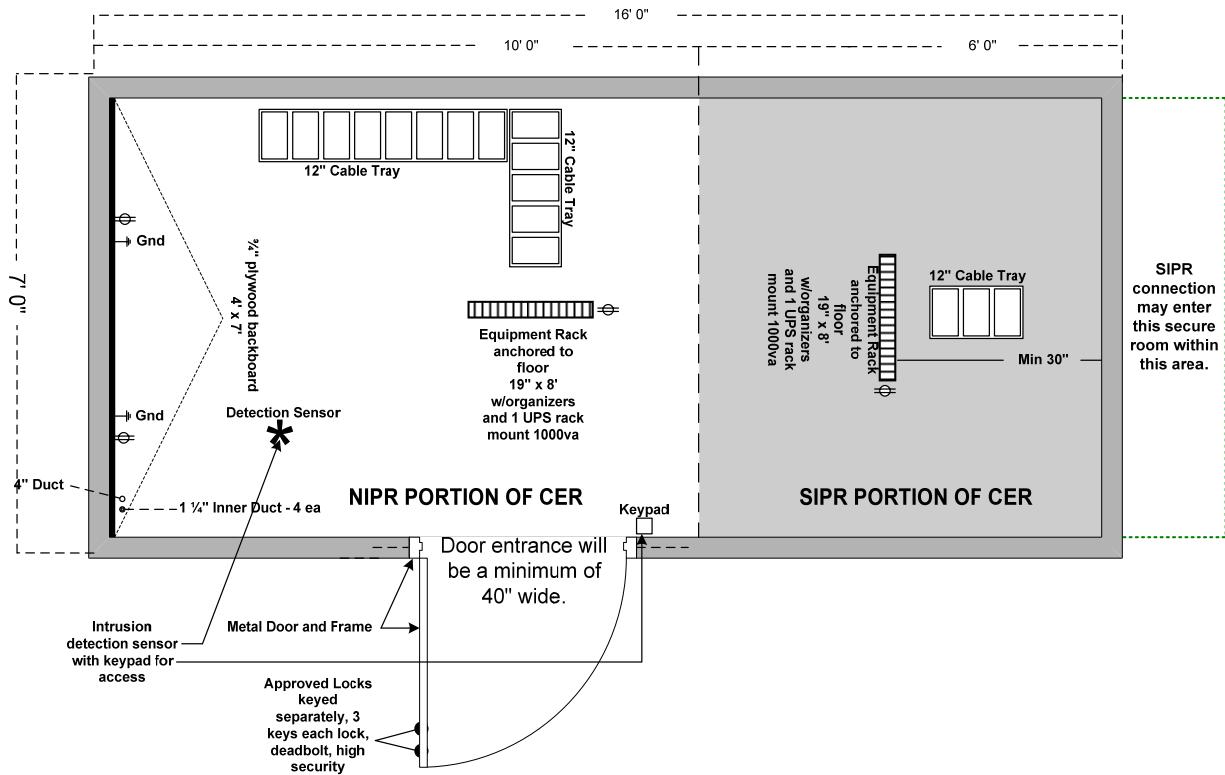


Figure 1: Combined or common CER for Brigade, Battalion, and Company Operations areas.

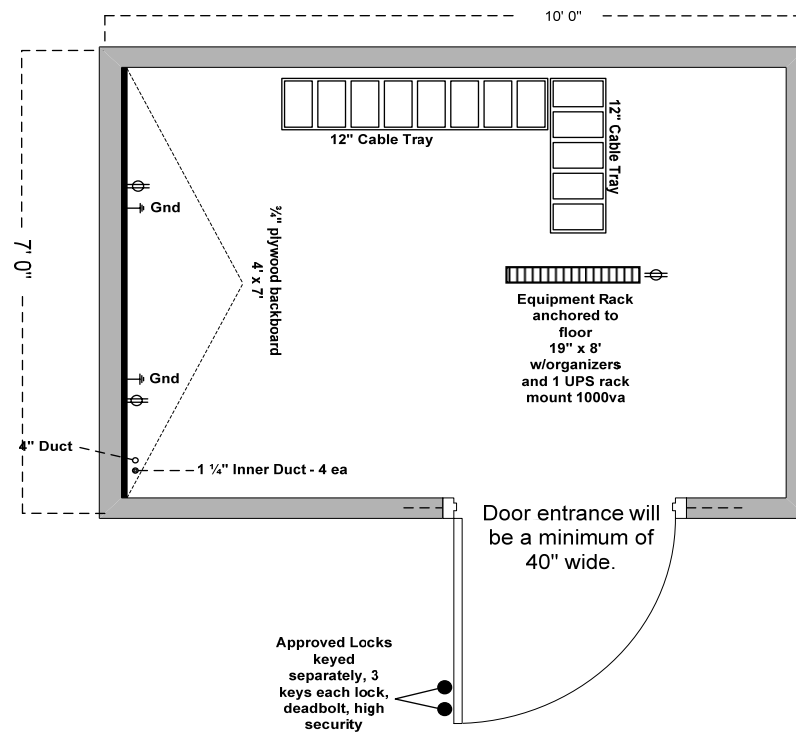


Figure 2: Motor Pool, Dining Facility and other operational areas.

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TYPICAL TELEPHONE CABLE RACKS

1. MINIMUM OF 3 RACKS ON EACH SIDE
2. CORNER RACK AT EACH TURN LOCATION

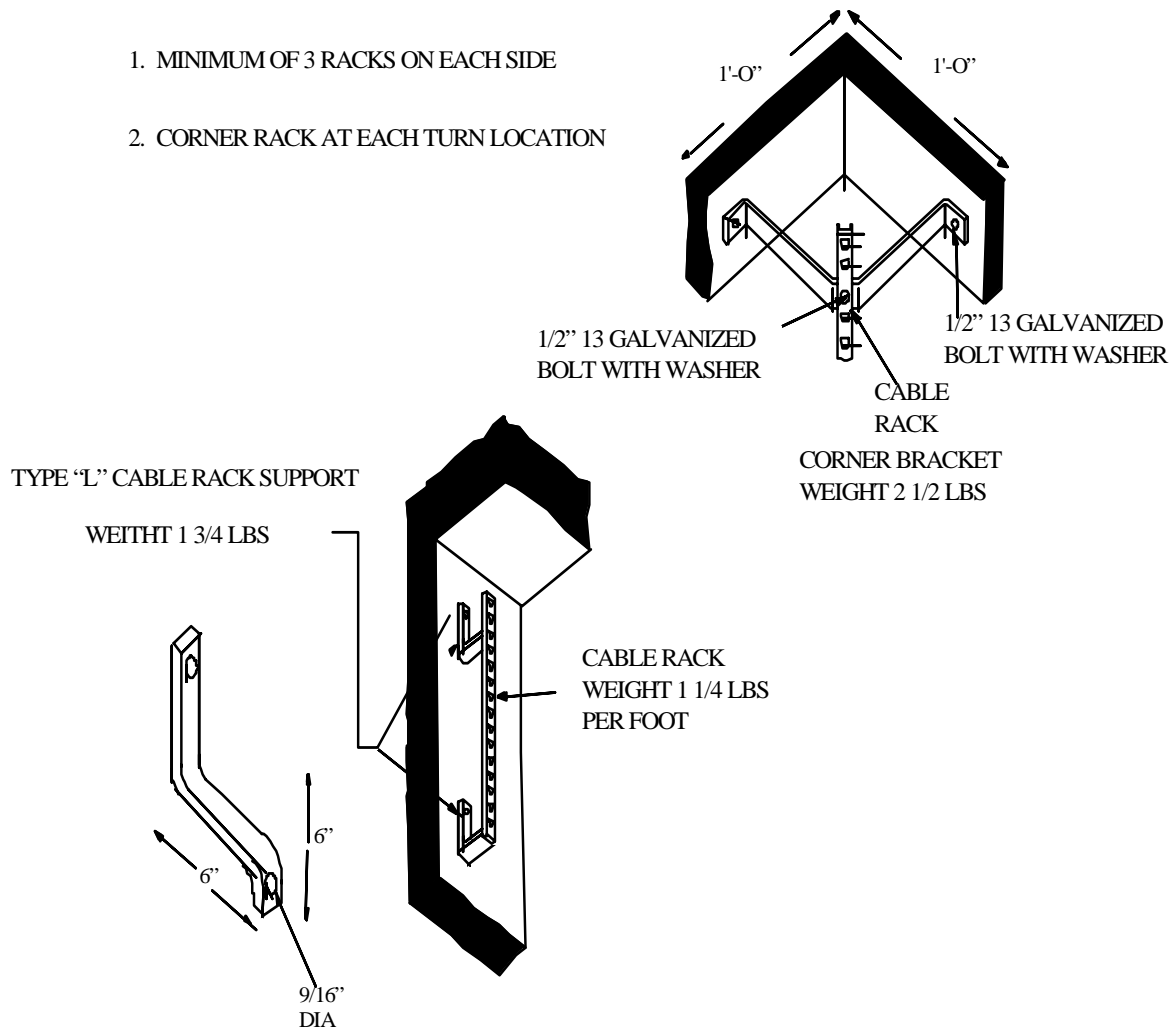
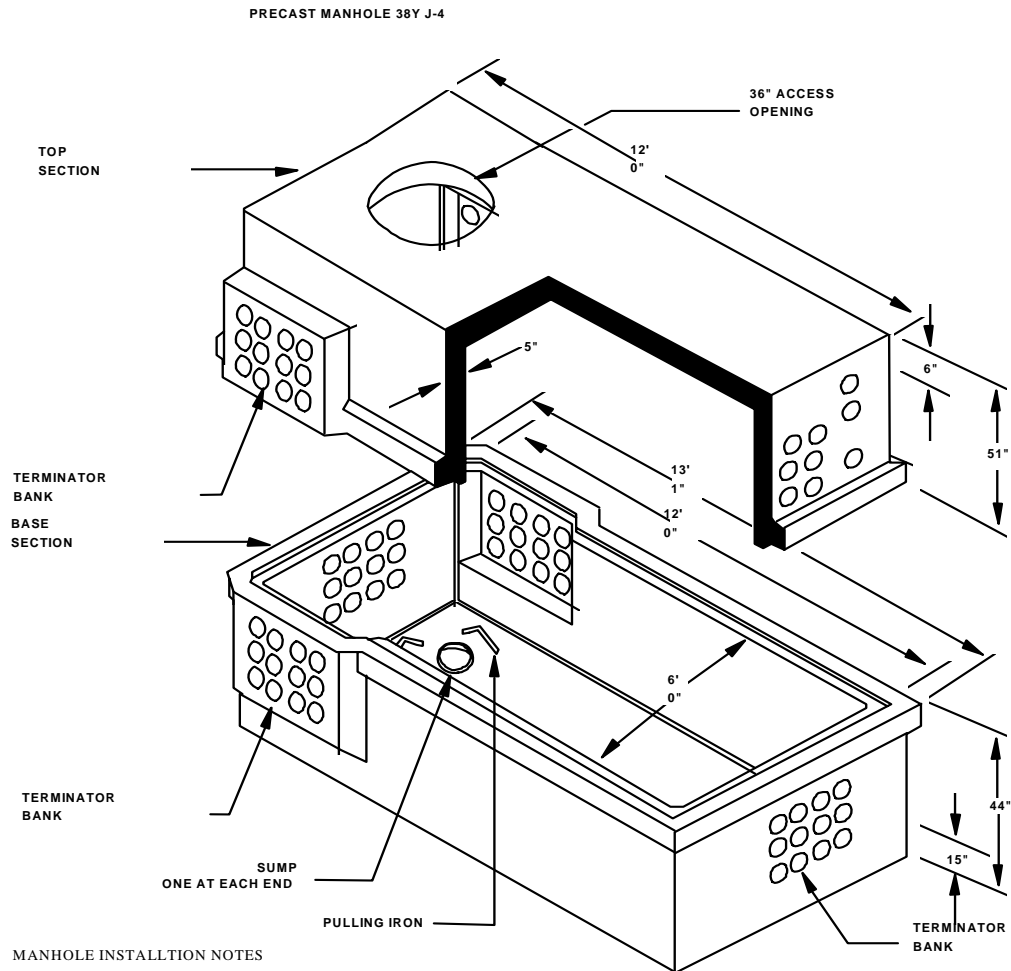


Figure 3: Telephone Cable Rack Instructions.

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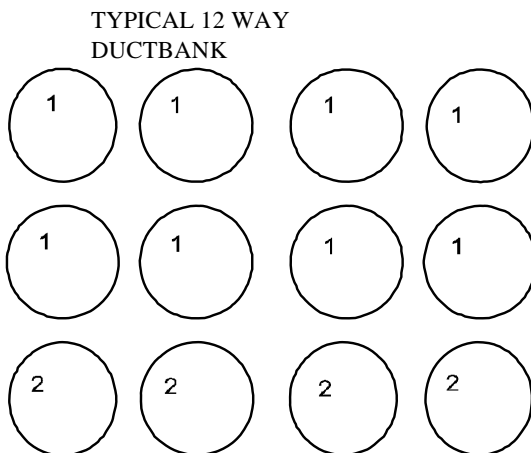
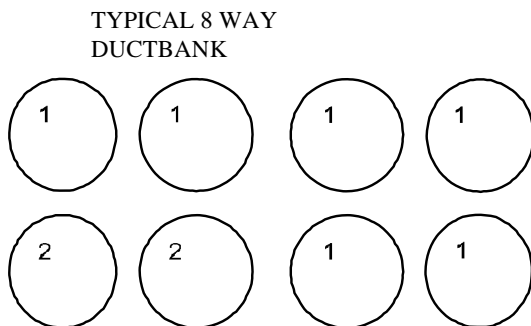
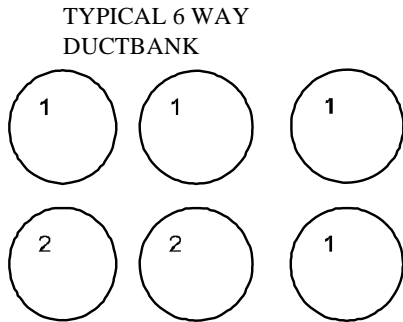
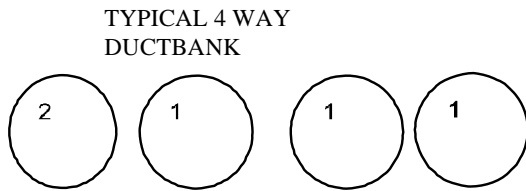


MANHOLE INSTALLTION NOTES

1. REQUIRED SIZE 12' X 6' X 7' (38Y-J4)
2. COORDINATE EXACT PLACEMENT OF MANHOLES WITH DOIM, (910) 396-8200/2908
3. MAXIMUM DISTANCE BETWEEN MANHOLES SHALL NOT EXCEED 600 FEET
4. CONCRETE ENFORCE ALL MANHOLE COLLARS PLACED IN ROADWAYS OR PARKING AREAS
5. PLACE MANHOLE A MINIMUM OF 12" DEPTH BELOW GROUND LEVEL AND A MAXIMUM OF 24" BELOW GROUND LEVEL.
6. GROUND ROD WILL BE PLACE IN THE REAR CORNER OF MANHOLE OPPOSITE THE SIDE TERMINATOR.
7. PLACE MANHOLES NEAR INTERSECTION WHERE POSSIBLE.
8. CONCRETE ENCASE ALL 45/90 DEGREE SWEEPS.
9. PULLING IRONS REQUIRED FOR EACH WALL.
10. CABLE RACKS INSTALLED FOR THE ENTIRE LENGTH OF MANHOLE

Figure 4: Requirements for precast manhole.

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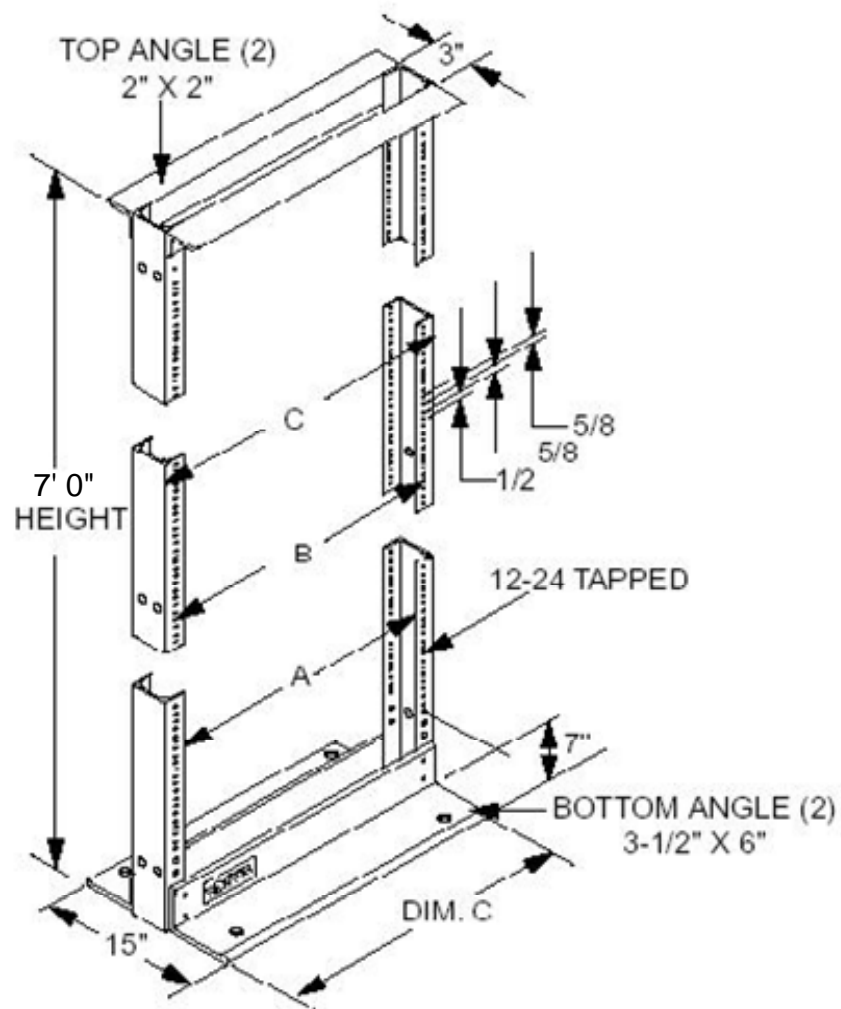
PVC INSTALLATION NOTES

1. MINIMUM 36" DEPTH
2. DUCT WILL ENTER THE MANHOLE AT THE BOTTOM OF TERMINATOR BANK AND IN THE BOTTOM BANK, DUCT PLACEMENT WILL BE CONSISTANT THROUGH THE MANHOLE RUN.
3. CONCRETE ENCASE AT ALL ROAD CROSSINGS , SWEEPS, AND PARKING AREAS.
4. NO MORE THAT A 3 INCH DROP (DEPTH) PER 10 FOOT SECTION.
5. NO MORE THAN ONE (1) 45 OR 90 DEGREE SWEEP PER 10 FOOT SECTION
6. DUCT CLEANING SHALL CONSIST OF A FLEXIBLE MANDREL THAT IS 1/4 INCH LESS THAN INSIDE DIAMETER OF DUCT, 2 WIRE BRUCHES, AN D A RAG. THE CLEANING ASSEMBLY SHALL BE PULLED THROUGH CONDUIT A MINIMUM OF 2 TIMES. A PULL STRING WILL BE PROVIDE IN EACH DUCT

LEGEND
1 = 4 INCH PVC
2 = 6 INCH PVC

Figure 5: Typical duct work for manholes.

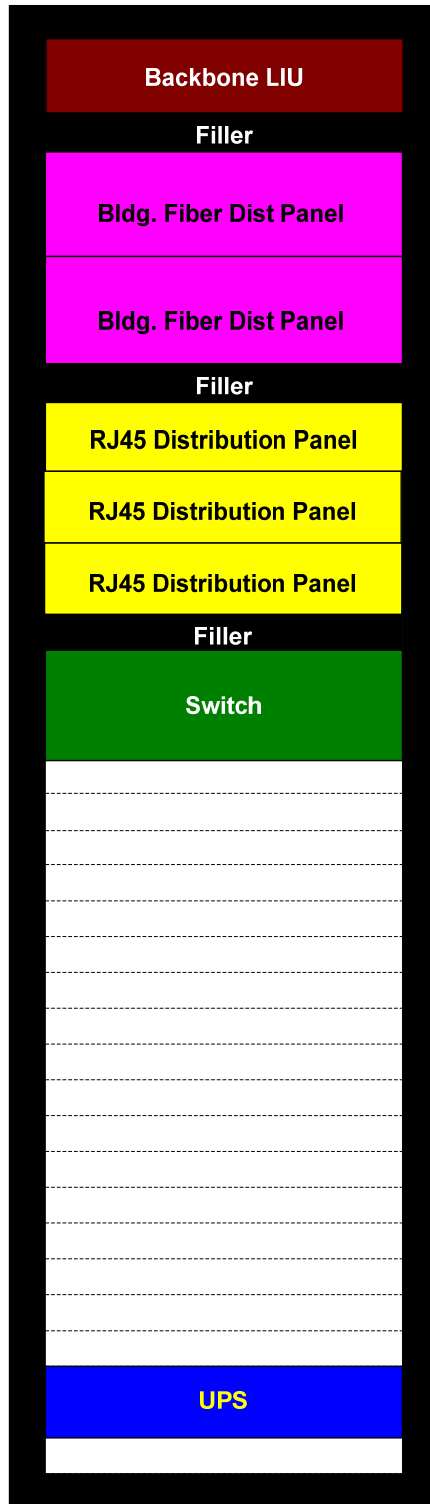
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Equipment Rack, Channel Type, Bolted, Double Sided, Free Standing, EIA Universal (5/8" – 5/8" – 1/2") Mounting Spacing

Figure 6: Standard 7'0" high, 19-1/2" wide (to accept standard 19" rack mounted equipment) floor secured rack.

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Each rack is to contain two shelves for installation by user.

Each rack to come with a wiring and distribution channel, each side.

Figure 7: Standard 19" rack configuration for the CER.

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Appendix A

Environmental Requirements

PARAGRAPH

- A-1 [Occupational Health Considerations](#)
- A-2 [Clean Air Act](#)
- A-3 [Clean Water Act](#)
- A-4 [Safe Drinking Water Act](#)
- A-5 [TSCA](#)
- A-6 [FIFRA](#)
- A-7 [Solid Waste Disposal Practices](#)
- A-8 [Hazardous Waste Disposal Practices](#)
- A-9 [Emergency Planning and Community Right-To-Know Act](#)
- A-10 [National emission standards for hazardous air pollutants \(NESHAP\)](#)

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APPENDIX A

Environmental Requirements

A-1. Occupational Health Considerations

Ft. Campbell has design Standard Operating Procedures for the following items and they shall be used in preparation of a design:

Confined Spaces:

Contractor shall observe OSHA Regulation 29 CFR Part 1910.146 regarding permitting, entry and working within confined spaces. Contractor is required to submit a work plan to the Contracting Officer's representative prior to entering any confined space.

Hazard Communication Program:

Contractor shall observe OSHA Regulation 29 CFR Part 1910.1200 regarding a written hazard communication program for describing how requirements for labels and other forms of warning, material safety data sheets, and employee information and training will be met. The program will also include a list of the hazardous chemicals known to be present and the methods used to inform employees of the hazards of non-routine tasks.

Lock Out, Tag Out Procedures:

Contractor shall observe OSHA Regulation 29 CFR Part 1910.147 regarding the control of hazardous energy (lock-out/tag-out).

Lock-out/Tag-out for Safety: The Contractor shall use a locking device that secures a valve or lever in the "off" position when a repair, inspection, or construction or new installation is required and also to clean or move any equipment. Making any exception to this rule could result in serious injury and death.

Lock-out: Blocking the flow of energy from the power source to the equipment - and keeping it blocked out - is called a lock-out system. A locking device is usually a key or combination lock arrangement.

Tag-out: Tag-out means placing a tag on the power source to warn co-workers or others not to turn the power on. The information on the tag shall include the name of personnel who put it there, the date, time the work begins, and type of work to be performed.

Basic Rules: Before shut down, the Contractor shall ensure that authorized employees know the type, magnitude, and hazards of the energy to be controlled; and shall verify

the method or means of the system. He shall inform all affected employees of the lockout. The equipment shall be turned off, and the Contractor shall lockout energy sources and tag-out at the disconnect point. Any stored or residual energy may be released at that time so the equipment can be tested. The Contractor shall restore energy safely.

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A-2 Clean Air Act:

A-2.1 Fort Campbell has specific Environmental points of contact, and requirements. These are available at the following Internet site:

<http://www.campbell.army.mil/envdiv/cleanairact.html>

A-2.2 Air permit information is to be provided by designers to Ft. Campbell Environmental Division prior to construction start. Construction permits are based on design. Operating permits are based on actual installation. Checklists for [Non-Process Source](#) and [Vent/Stack](#) are included at the end of this Appendix for designers' use. Ft. Campbell will obtain construction and operating permits. POC is Patty Lockard at 270-798-9603.

A-2.3 Information on refrigerant equipment must be submitted to Ft. Campbell Environmental. Use of ozone depleting substances (class 1, CFC's, Halon) shall not be used. Class 2 refrigerant may be specified but will be outlawed by the year 2010. Class III HFC's preferred.

A-2.4 Tennessee requires list of all fuel burning equipment, not just items over a million BTU's or above. Permits take 3-6 months to acquire and will be obtained by the Environmental Division from information supplied by designers.

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A-3 Clean Water Act:

A-3.1 Ft. Campbell POC is Gary Sewell at 270-798-9588.

A-3.2 Ft. Campbell averages 3 million gallons per day. The high has been 13 million gallons. The desire is to not exceed this.

A-3.3 Water volume calculations need to be submitted. There is a two to three month review time by State. Can walk permit through. Storm water shall not discharge into sanitary sewer.

A-3.4 When sinkholes are encountered close them, and route water to natural storm drainage patterns. Must have permit from Tennessee to close sinkhole. Double sandbag or hay bales if sinkhole is part of the drainage pattern on a construction site.

A-3.5 If water is discharged into Kentucky, then Kentucky permit will be required.

A-3.6 If oil/water separators are used then design shall be the open top type. Ft. Campbell Environmental Division will provide oil/water separator design.

A-3.7 Specifications and sizing data for construction of the grease interceptor are available to the design team. Designer will contact Gary Sewell for this information. State of Tennessee has sizing criteria. Grease interceptors shall be located for ease of access for cleaning by pumper truck.

A-3.8 Pollution prevention plan must be maintained during construction. Notice-of-intent is required prior to moving any earth.

A-3.9 See Specification [Section 01560, Environment Protection](#). Specifications must address spill containment for contractor and should contain language for servicing of construction vehicles. Five copies of Spill Contingency Plans shall be specified. The Contractor shall be required to mail or submit one copy of a Spill Contingency Plan to:

Wayne Hinson
Environmental Division, PWBC
Building 2186, 13-1/2 Street
Ft. Campbell, KY 42223

And, four copies to the Contracting Officer. The Contractor shall not start work until the Spill Contingency Plan is approved by the Contracting Officer. If the contract does not require any plan for a specific project, he shall apply for an exception to the Contracting Officer with a copy to Mr. Hinson, Environmental Division at address indicated above. For further information or guidelines in order to prepare Spill Plan contact Environmental Division, PWBC at 270-798-3105.

A-3.10 Dumping of any liquids on the ground will be considered a release.

A-3.11 Floor drains are not to be provided except where required. They will be provided in a judicious manner, only where necessary. Old sewage system cannot take load. Shower drains are okay but wash-down drains are not acceptable. Mud Rooms must go

to sanitary sewer. Discharge cannot adversely affect waste treatment. Biggest concern is volume. Ft. Campbell treatment facility almost maxed out. This is the reason shop washdown is not allowed. Must adhere to approved provisions for washing tents or vehicles. Washing must occur on grass areas.

A-3.12 Must pretreat boiler blowdown before discharge due to base sewer toxicity levels being a noted problem.

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A-4 Safe Drinking Water Act:

A-4.1 Dead end water lines shall not be installed. Lines must be looped and disinfected. POC is Larry Martin at 270-956-1801.

A-4.2 Backflow prevention is required on domestic water only and must be approved by state of Tennessee.

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A-5 Toxic Substance Control Act (TSCA):

A-5.1 Lead paint:

A-5.1.1 Lead paint protection required for working personnel in accordance with OSHA requirements. Lead exposure for air quality will be tested when first building of many on the site are to be demolished. If test okay, no test thereafter.

A-5.1.2 Lead-Based Paint Notification Requirements for Work in Family Housing:

A-5.1.2.1 There is a new Federal requirement to notify family housing occupants when work in their quarters will disturb known or suspected lead-based paint (LBP). This requirement became effective 1 June 1999 and will affect all Army Family housing built prior to 1978. This final rule is issued under the authority of section 406(b) of the Toxic Substance Control Act (TSCA), 15 U.S.C. 2686(b) as amended by the Residential Lead-Based Paint Hazard Reduction Act of 1992 to add Title IV, entitled Lead Exposure Reduction. The Residential Lead-Based Paint Hazard Reduction Act is also referred to as Title X of the Housing and Community Development Act of 1992, Public Law 102-550. A copy of this requirement can be found in the Federal Register, 1 Jun 98, at <http://www.epa.gov/fedrgstr/EPA-TOX/1998/June/Day-01/t14437.htm>.

A-5.1.2.2 The requirement is that whenever maintenance, repair, or renovation is performed in or on an occupied unit and LBP is disturbed (resulting in flaking or dust) that the worker (both in-house and contractor) must provide the occupant a copy of the pamphlet, "Protect Your Family from Lead in Your Home". The Pamphlet can be obtained at <http://www.hud.gov/lea/leadhelp.html>. This is the same pamphlet that is

required to be given to occupants by the housing office when they are assigned to quarters containing lead-based paint (per ACSIM Memo, Subject: Disclosure Requirements for Lead-Based Paint Hazards in Army Family Housing, dated 24 Jul 96). The worker must also attempt to obtain from the occupant a written acknowledgment that the occupant has received the pamphlet (sample language on the above web site). These records must be kept for three years. This requirement also applies when work is done in common areas of occupied multi-unit family housing. The Garrison commander (or designated representative, such as the housing manager), as the owner's representative, must also be notified.

A-5.1.2.3 Contractors working in occupied AFH are also required to issue this pamphlet and this should be verified by the Government inspector. Current contracts should be modified as necessary to comply with this new requirement. Pre-1978 AFH units that are certified as free of lead-based paint and units that are vacant due to major renovation or between occupancy are exempt from this requirement. This requirement does not apply to minor repair and maintenance activities (including minor electrical work and plumbing) that disrupt 2 square feet or less of painted surface per component.

A-5.1.2.4 PAINTER-L is a computerized tool currently available to help manage the presence of LBP and LBP hazards. For more information on this system contact Dr. Ashok Kumar, CERL, at 1-800-USA-CERL.

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A-5.2 Radon:

A-5.1.1 Building design must have Radon protection features. In the specifications, Contractor is to be required to test the building for radon after construction is complete.

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A-6 Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA):

A-6.1 Fort Campbell has an approved insecticide and pesticide list contained in the Installation Pest Management Plan (IPMP). The current IPMP's approved list of pesticides will be used in the preparation of the appropriate contract documents. All insecticide and pesticide work on Fort Campbell must comply with the IPMP.

A-6.2 Contractors will submit a report of the pesticides used, type and amounts, on Ft Campbell to the FIFRA program manager. Applicators of pesticides on Ft. Campbell must be licensed in Kentucky and Tennessee.

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A-7 Solid Waste Disposal/Diversion Practices:

A-7.1 In the interest of reducing waste, Fort Campbell is actively recycling and reducing waste in all on-post operations. Contractors are required to participate in on-post programs. They are encouraged to find ways of reducing waste. Recycling shall be practiced to the maximum extent possible. Refuse materials shall be separated in accordance with installation policies and practices.

A-7.2 Dumpster service is not provided by the installation. Contractors shall arrange for dumpster service at their own expense.

A-7.3 Landfill:

A-7.3.1 It is the intent of the installation to divert at least 40% of all construction demolition debris from the Woodlawn C/D landfill. Buildings and building materials removal / deconstruction activities shall be executed with landfill diversion as a primary goal.

A-7.3.2 Point of contact for landfill issues is Trudy Carr at 270-798-9782.

A-7.3.3 Landfill Access:

- Upon award of a contract the name of the contractor, the contract number, project name and the completion date of the contract is furnished to the Public Works Business Center Environmental Division, which will in turn furnish passes for the contractor's use in delivering refuse and debris materials.
- All loads of debris will be weighed and recorded in the landfill data base. Scales are available at the landfill. Each month, tabulation (by contract number) will be furnished to contracting office indicating the amount of debris generated by that contract. Trucks and/or trailers shall be weighed coming in and going out of the landfill. The vehicle operator shall have a pass from the contractor to obtain entrance into the landfill. The operator's name and vehicle license number will be recorded in the data. Other information that will be recorded includes whether the load contained asbestos or any other authorized special waste and whether the load contained recyclable materials.

A-7.4 Materials Handling:

A-7.4.1 Demolition and removal Activities:

- Contract specifications shall require at least a 40% diversion of demolished building materials such as wood, plumbing fixtures, electrical materials (lights and panels), windows, doors, toilet partitions, HVAC equipment, and scrap metals be diverted from the landfill. Diversion can be accomplished by deconstructing the wood buildings and components per instructions below or by moving the structure off-post. Construction specifications shall require a Building Materials Diversion Plan to be submitted and approved by PWBC.

A-7.4.1 (a) Salvageable materials shall not to be transported off the installation. Government salvage requirements shall be evaluated on a project by project basis and salvage rights automatically apply for the following equipment:

Transformers

Cut-outs

Capacitors

Circuit Breakers

Voltage Regulators

Line hardware

Utility Poles

Salvageable metals that are recovered as a result of grinding shall be separated for sale as scrap metal.

- All salvageable materials removed from the project site shall be delivered to DRMO for selling as scrap metal. The Contractor must ensure Fort Campbell funding code is utilized when materials are turned in. The funding code is 21F3875 1111 76 C S15056 AC 9921, which shall be included in the project.

A-7.4.1 (b) Nonsalvageable materials shall not be removed from the installation. They shall be taken to the landfill or diverted for recycle as recovered materials.

- Street surfacing (asphalt/concrete), sidewalks, curbs & gutters, etc., and building related Concrete and masonry materials shall be ground up at the construction site and transported to an offsite location designated by the COR. Materials to be ground up shall not have foreign items (doors, windows, piping, PVC items, toilet partitions, plumbing fixtures, etc) included that will render the ground products un-useable.
- These materials may also be transported and stockpiled at the Woodlawn C/D landfill for future grinding. However, Ft. Campbell has placed limits on the size of materials (especially concrete and asphalt pavement) that can be placed in the landfill. These materials shall not exceed more than 2 feet by 3 feet and shall be no thicker than 18 inches.
- Bricks may be delivered whole and recycled to meet diversion goals.
- Land clearing waste (trees, stumps, etc.) shall be mulched at the contract site and delivered to a location designated by the Contracting Officer Representative (COR). Land clearing waste shall not to go into landfill.

A-7.4.2 New Construction Activities and Contracts:

- All waste and debris that is part of and results from new construction activities shall be removed from Ft. Campbell. It is the contractor's responsibility to insure materials are properly disposed and expeditiously removed from the installation.
- Contractor-owned scrap metals, cardboard and pallets make up a big portion of the recyclable materials that are common to new construction and shall be recycled by the contractor's efforts off site.

A-7.5 Construction projects requiring soil borrow material should be coordinated with Trudy Carr, PWBC Environmental Division at 270-798-9782.

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A-8 Hazardous Waste Disposal Practices:

A-8.1 Mercury containing light bulbs such as fluorescent tubes, mercury vapor, metallic halide, and high-pressure sodium lamps shall be considered as hazardous wastes and require special handling. Fluorescent, mercury vapor, metallic halide, and high pressure sodium light bulbs, while not a listed hazardous waste, may be a characteristic hazardous waste and therefore subject to testing and proper disposal as per RCRA. These lamps are a concern at Fort Campbell in regard to their disposal. Disposal of these materials resulting from demolition or other PWBC related activities, shall be coordinated with the PWBC Environmental Quality Officer for the policy contained in Section 11 of the EQP Handbook.

A-8.2 Low-pressure sodium lamps are not listed hazardous wastes but require special handling.

A-8.3 Refrigerant in air conditioning equipment being demolished must be recovered and transported to the Environmental Division Pollution Prevention Operations Center for reclaiming.

A-8.4 PCB's is a concern for HVAC/Electrical and capacitors. Capacitors in existing air conditioning equipment may contain polychlorinated biphenyl's (PCB's).

A-8.5 Fluorescent ballast in buildings to be demolished may contain PCB's.

A-8.6 Transformers as well as all fluorescent ballasts and HVAC/Electrical capacitors to be removed may contain PCB's. Transformers shall be turned over to DRMO.

A-8.7 Lighting ballast and capacitors are to be placed in 55-gallon drum and delivered to the Environmental Division Pollution Prevention Operations Center..

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A-9 Emergency Planning and Community Right-To-Know Act (EPCRA):

A-9.1 Ft. Campbell is required by Executive Order 12856, "Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements", to comply with the requirements of the Emergency Planning and Community Right-to-Know Act (EPCRA). EPCRA requires Ft. Campbell to identify the amounts of chemicals present on, or released from its facilities, understand the potential problems that hazardous materials pose to the surrounding communities and environment, and provide information to the public and local emergency planning organizations. To comply with EPCRA requirements, Ft. Campbell must track and be accountable for hazardous materials (HM) used throughout the installation. The Contractor must submit information describing hazardous materials (paint, solvents, adhesives, treated lumber, etc) on **FTCKY HAZMAT INVENTORY FORM** to the Environmental Division Pollution Prevention Branch. The Contractor will account for the quantity of HM brought to the post, the quantity used or expended during the job, and the leftover quantity to be removed from the installation. This information will be provided on a calendar year basis and must be submitted by the end of January following the year reported. Tracking of hazardous materials used by the Contractor shall be required by the contract.

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CHECKLIST FOR NON-PROCESS SOURCE

Organizational Owner/Operator: _____
Date: _____ Interviewer: _____
Facility: _____ Contact: _____ Phone: _____
Bldg. No.: _____ Room No.: _____ Source No.: _____

FOR DPW-E USE ONLY

Permit Status: ☐ Required ☐ Not Required
Permit Type: ☐ Operating ☐ Construction ☐ Relocation ☐ Modification

General

1. Description and designation of source (Boiler #1, Hot Water Heater #1, etc.)

2. Construction date (manufactured) _____ Date commenced operations _____
Installation date (at site) _____
3. Manufacturer _____
Model No. _____ Serial No. _____
4. Normal operating hours _____ hrs/day, _____ days/week, _____ weeks/yr.
5. % operating (time) by calendar year per quarter
_____ 1st _____ 2nd _____ 3rd _____ 4th.
6. Maximum (potential) operating hours
_____ hrs/day, _____ days/week, _____ weeks/yr.
7. Fuel type: Primary fuel _____ Standby fuel (if any) _____
BTU values of fuels: Primary fuel _____ Standby fuel (if any) _____
8. Primary use of heat source _____
Secondary use of heat source (if any) _____
9. If coal burner, type of firing? _____
10. Maximum rated boiler horsepower (BHP) _____
Heat input capacity (MMBtu/hr) _____
Maximum rated electrical Output (kw) _____ (if applicable)
11. Average % load _____ or actual maximum heat input value used _____ MMBtu/hr
12. For fuels other than natural or liquified gases:

CHECKLIST FOR NON-PROCESS SOURCE (continued)

% Sulfur content _____
% Ash _____ (if solid fossil fuel)

13. Average annual fuel consumption: Primary _____ (☐ ft³ ☐ gal - check one)
Secondary _____ (☐ ft³ ☐ gal - check one)

14. Emissions monitoring equipment installed? ☐ Yes ☐ No

(If yes, describe above)

[ATTACH COMPLETED CONTROL DEVICE(S)/TECHNIQUE(S) CHECKLIST(S)]

15. Is the source operated under a current operating or construction permit? ☐ Yes ☐ No
(If yes, obtain copy of permit and attach to this checklist)
16. If fuel oil is used, is the unit served by a fuel storage tank? (check one) ☐ Yes ☐ No
(If yes, complete and attach Storage Tank Checklist)
17. Is a fuel flow meter installed for
a. Natural gas (check one): ☐ Yes ☐ No
b. Other fuel (check one): ☐ Yes ☐ No

[ATTACH COMPLETED STACK/VENT CHECKLIST FOR NON-PROCESS OPERATION]

Comments

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VENT/STACK CHECKLIST

Organizational Owner/Operator: _____
Date: _____ Interviewer: _____ Initials: _____
Facility: _____ Contact: _____ Phone: _____
Bldg. No.: _____ Address: _____ Permit No.: _____

General

1. Description of emission (particulate matter, gaseous, mix, species name, etc.)

2. Identify source(s) served _____

3. Are the emissions air contaminants? (check one) ☐ Yes ☐ No
4. Does the source also have the potential for fugitive emissions? (check one) ☐ Yes ☐ No
(If yes, describe nature of fugitive emissions in the comment section.)
5. Has there been a stack test for this source? (check one) ☐ Yes ☐ No
(If yes, attach copy of stack test documents to this form)
6. Has there been a surrogate stack test for this source? (check one) ☐ Yes ☐ No
(If yes, attach copy of stack test documents to this form)

Pick-up Duct Data

1. Hood Type _____
2. Hood Dimensions Slot Length _____ Slot Width _____
Distance from Hood Face to Contaminant _____
Hood Face Area _____
Measured Air Flow at Hood _____
Measured Face Velocity _____
Hood Static Pressure _____
Duct ID _____
Duct Length to Bldg. Exit _____
Contaminant Capture Temp. _____
3. Contaminant Data
Name _____ Constituency Portion
(list measurement units) _____

VENT/STACK CHECKLIST (continued)

Vent Information

1. Inside diameter (ID) at exit _____ (ft)
2. Vent height:
 - a. Above ground _____ (ft)
 - b. Above roof level _____ (ft)
3. Gas stream exhaust exit temp _____ (°F)
4. Exit velocity _____ (ft/sec), at _____ °F, _____ (air pressure - note measurement units) and standard conditions (68 °F and 1 atm) _____ (ft/sec)
5. Exit flow at exit conditions _____ (ft³/min)
Obtained from (check one): ☐ calculations ☐ test data
Exit flow at standard conditions _____ (dscfm)
6. Stack gas moisture percent at exit conditions _____ % ☐ By Weight ☐ Grains Per Dry Standard Cubic Foot (gr/dscf)
7. Exit plume direction (check one): ☐ Up ☐ Down ☐ Horizontal
8. Exhaust fan data: horsepower _____ RPM _____ volume rate _____ (ft³/min)
9. Air pollution controls installed? (check one) ☐ yes ☐ no
(If yes, complete and attach Control Device/Technique Checklist)
10. Is there a Bypass Stack? Y or N
If so, describe and complete vent/stack form for the Bypass Stack.
11. Is this stack equipped with continuous Pollutant Monitoring equipment? Y or N
If yes, what Pollutants are monitored.

Attach drawing of emission source showing air contaminant flow from process to atmosphere.
Complete the additional applicable process or non-process checklists.

Comments

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APPENDIX A

Environmental Requirements

A-10. National emission standards for hazardous air pollutants (NESHAP)

Ft. Campbell has design Standard Operating Procedures for the NESHAP items and they shall be used in preparation of a design:

State of Kentucky and Tennessee NESHAP Reporting Requirements for Demolition (Defined as the demolition of a building or demolition of a load supporting structure such as a load-bearing wall) shall be followed:

1. In the case of demolition only, the contractor will mail and be postmarked, fax and follow-up with a mailing, or deliver the NESHAP notice 10 working days before demolition begins even if the operation involves removal of “non-regulated” ACM only in any amount, OR even if the operation involves no ACM removal whatsoever!

2. In the case of demolition where asbestos abatement is also involved, the contractor will send in a separate notice for the abatement as required in paragraphs 2.a. through 2.d. below. The abatement notice may also be included on the demolition notice, so that only one notice may be sent. In this case, include the additional notice lead times as identified in paragraphs 2.a. through 2.d.

a. The Contractor is requested by the state to telephone at least 24 hours beforehand if the operation involves RACM that is below 260 LF, 160 SF, or 35 CF. This only applies in the contractor has sent a long-term NESHAP notification to the State.

b. The Contractor will mail and be postmarked, fax and follow-up with a mailing, or deliver the NESHAP notice 10 working days beforehand if the operation involves RACM that is below 260 LF, 160 SF, or 35 CF (and if the contractor has not sent a long-term NESHAP notification to the State).

c. The Contractor is requested (not a regulatory requirement) by the State to mail, fax, deliver a notice, or phone in the notice so that it is received at least 24 hours beforehand if the operation involves non-regulated ACM in any amount. (In any case, the government “project designer” may still specify that the contractor does a NESHAP notice for any asbestos removal actions. This would be advantages to the government.)

d. The Contractor will mail and be postmarked, fax and follow-up with a mailing, or deliver the NESHAP notice at least 10 working days before abatement begins if the operation involves RACM that is at least 260 LF, 160 SF, or 35 CF.

3. All Kentucky notifications are sent to:

Sherl Devers
Kentucky Division for Air Quality
Asbestos Branch, Paducah Region
4500 Clarks River Road
Paducah, Kentucky 42003
(502) 898-8468 Office
(502) 898-8640 Fax

All Tennessee notifications are sent to:

Mr. Randal Harrison
Tennessee Division Air Pollution Control
9th Floor, L & C Annex, 401 Church St.
Nashville, Tennessee 37243-1531
(615) 532-0554 Office
(615) 532-0614 Fax

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APPENDIX B

State Water/Sewer Submittals

5-7.1 General:

5-7.1.1 For Fort Campbell projects, sewer or water line extensions constructed on the Tennessee side of the installation will fall under review and permitting authority of the State of Tennessee and sewer or water line extensions constructed on the Kentucky side of the installation will fall under review and permitting authority of the State of Kentucky.

[Coordinate requirements and points of contact in Appendix F.](#) Drawings and specification, along with a cover letter and permit review fee will be forwarded to the Ft. Campbell Utilities Branch for submittal to the State.

5-7.1.2 **Designers are NOT to contact the Kentucky or Tennessee regulators** except to obtain copies of regulations. Coordinate construction issues with the PWBC Utilities Branch. Compliance issues will be handled by PWBC Environmental Compliance.

5-7.2 Tennessee:

5-7.2.1 The following is guidance for Water/Sewer submittals for Tennessee review:

Water/Sewer Submissions for Tennessee Review **April 1998**

I. Designers should have the following Tennessee guidelines:

Water: 1. Chapter 1200-5-1 dated Jan. 1997

Chapter 1200-5-.01 – Authority

Chapter 1200-5-.02 – Purpose

Chapter 1200-5-.03 – Scope

Chapter 1200-5-.04 – Definitions

Chapter 1200-5-.05 – Supervision of Design & Construction

Chapter 1200-5-.17 – Operation & Maintenance Requirements

Chapter 1200-5-.20 – Record Maintenance

Chapter 1200-5-.32 – Fees for Public Water Systems

2. Community Public Water Systems DESIGN CRITERIA dated 1991 (blue cover)

3. Regulations for Public Water Systems and Drinking Water Quality dated Jan. 1997

4. Tennessee Safe Drinking Water Act (including 1988 Amendments)

5. Address for copies of standards & for review of designs:

State of Tennessee
Department of Environment & Conservation
Division of Water Supply
6th Floor, L & C Tower
401 Church Street
Nashville, TN 37243-1549
POC: Ali Norbasah
Phone: (615) 532-0163

Sewer: 1. Chapter 1200-4-3 dated Sep 1991

Chapter 1200-4-3-.02 – General Considerations
Chapter 1200-4-3-.04 – Definitions

2. Design Criteria for Sewage Works dated April 1989

Chapter 1 – General Engineering Requirements
Chapter 2 – Sewer & Sewage Pump Stations
Chapter 14 – Instrumentation, Control, and Electrical Systems

3. Sanitary Survey Manual for Public Community Water Supplies revised 1997 (orange cover)

4. Address for copies of standards & for review of designs:

State of Tennessee
Department of Environment & Conservation
Division of Water Pollution Control
6th Floor, L & C Tower
401 Church Street
Nashville, TN 37243-1534
POC: Sam Weiland/Wade Murphy; Phone: (615) 532-0625

II. Tennessee wants to see:

Eight copies of design/drawings/hydraulic/specification packages submitted to:

State of Tennessee
Manager, Engineering Section
Division of Water Supply
6th Floor, L & C Tower
401 Church Street
Nashville, TN 37243-1549; Phone: (615) 532-0191

Drawings-only ones relevant to utility work (no architectural details, structural, etc.)

- stamped by Tennessee professional engineer
- include utility site maps, utility detail sheets
- include a general map showing magnitude of the whole project (For example, site map of new barracks complex showing all the buildings)
- Testing of new water lines, copies of test results and Tennessee certified lab (should also go to water plant)

- Recommended:
 - Submittals of materials, certifications (installation, testing laboratory), etc., go to the water or sewer plant. (MCA does go to the Maint. Div. But difficult to extract specific of utility work. PWBC design by Engr. Plans, JOC and credit cards are much sketchier. Some is retained and then eventually discarded at the end of the year.

III. Important Elements:

Additional Permits for stormwater/sinkholes may be required.

Tennessee approvals are valid for one year, construction must start in that year.

Tennessee approval is required for change orders to previously approved construction.

Drawings should be no smaller than 24" x 36"

DO NOT contact the Tennessee regulators for a ruling on an issue. That is the responsibility of Environmental Division (Gary Sewell). Discuss with Gary first before the state is called.

Three reasons:

1. Environmental is responsible for setting policy on Fort Campbell
2. Phone call may affect how the regulators "think of us" or something may be said to cause a NOV or inappropriately release information.
3. May be seeing only the piece of the project you are involved with. Environmental charged with looking at all the pieces and the relationship/impacts of each piece.

SEWER:

Sewer manholes are pressure tested.

No sewer bypasses (caused by new work or during construction)

Check dams on sewer lines at manholes.

Tennessee does not govern septic tanks, falls to local county health departments.

(Basically, get PERT test of soil by them before and they inspect construction.

WATER:

New water lines are sterilized

Prefer Fort Campbell plant perform tests (inspector collect)

Can allow contractor to perform test if Tennessee approved lab is used.

No dead-end water mains.

Min 20 psig residual pressure at all locations in distribution system.

Min 500 GPM flow at all locations in the distribution system.

(AR requirement for 1000 GPM min. at CAAF & Sabre since they're airfields).

Hydraulics should be based on actual flows (available from Fire Dept or Ronnie Jones).

Modeling programs are acceptable for hydraulics. A letter of explanation is a good idea if the data is difficult to interpret.

Minimum of 6" to a fire hydrant. Good practice is not over 300 feet.

Deluge fire lines are excluded (should have backflow preventor off potable main).

Backflow preventors are required inside of buildings (installation overall plan approved by Tennessee is inherent requirement).

Watts backflow devices are preferred.
All backflow devices must be on the Tennessee approved list.
Tennessee review is required even if hooking to off-post utilities (Woodlawn or Christian County)

5-7.2.2 The following is Tennessee Plans Review Fee Worksheet:

<http://www.state.tn.us/environment/dws/forms/feesheet.pdf>

5-7.3 Kentucky:

5-7.3.1 The Kentucky will regulate those water and sewer utilities which fall on the Kentucky side of the post.

5-7.3.2 Kentucky does not want to see simple in-kind replacements of sewer lines and manholes. State review if increasing a pipe size or rerouting lines. All new lines or rehab of sewage lift stations would have to be submitted. However, construction not submitted to Kentucky will still have to meet state requirements.

5-7.3.3 Kentucky review time is 45 days. They also want to see that the utility itself approves the construction (i.e. will continue current practice of routing the packages through PWBC-Utility Branch for signature before packages go to the state).

5-7.3.4 Sewer lift stations have a requirement for 2 hours of wet well storage based on average daily flow or must be on a generator for redundant electric service. A Kentucky PE stamp will be required for all submissions.

5-7.3.5 Sewer submittals require at least 3 sets, 2 for the State to keep and 1 for the State to return. Recommend 5 set be submitted, 2 for the State to keep, 1 for contractor on site, 1 for the inspector, 1 for PWBC-Utilities, and extra for KO/etc. Submittal shall be no larger than 24" x 36". Kentucky will sign and return the extra sets of submittals. One set must have a "wet seal" of the PE stamp, the others can be copies. Application must be filled out for a "sewer line extension". Copy of application is contained in paragraph [5-7.3.14](#).

5-7.3.6 Kentucky wants pump station info (pump curves, flows), sewer line profiles and plan view. Letter from owner (i.e. PWBC Utilities) saying Ft. Campbell will accept responsibility for the O&M of the sewer line when it is constructed and that Ft. Campbell will accept the additional flow.

5-7.3.7 Kentucky does not require a "construction notification start notice". However, Kentucky will require a letter after construction saying installation was performed per plans and specs.

5-7.3.8 Review fees are:

Small Facility - \$200 (pump station or sewer/forced main less than 2500 feet)

Intermediate Facility - \$400 (pump station or sewer/forced main 2500-5000 feet)

5-7.3.9 Water submittals require at least 3 sets, 2 for the State to keep and 1 for the State to return. Recommend 5 set be submitted, 2 for the State to keep, 1 for contractor on site, 1 for the inspector, 1 for PWBC-Utilities, and extra for KO/etc. Submittal shall be no larger than 24" x 36". Kentucky will sign and return the extra sets of submittals. One set must have a "wet seal" of the PE stamp, the others can be copies. Requirements are PE stamp, letter of acceptance from utility, engineering calculations, hydraulic analysis, anticipated water demand, compliance with "Ten States Standard" and design/construction cost estimate for the drinking water portion. Complete the Water Line Submittal Checklist contained in paragraph [5-7.3.15](#) for the water submissions.

5-7.3.9.1 The "Ten State Standard" is available at:

Health Education Services
P.O. Box 7126
Albany, New York, 12224
Phone 518-439-7286.

5-7.3.10 Ft. Campbell will continue to place the PWBC Utilities stamp on the sets and sign/date. This signifies PWBC as the "utility owner" is accepting this design and forwarding to the state.

5-7.3.11 Review fees must be payable to "Kentucky State Treasurer.

5-7.3.12 Kentucky regulations are available on the Internet at
<http://www.lrc.state.ky.us/KAR/TITLE401.HTM>

CHAPTER:	SPECIFIC SECTIONS TO LOOK AT:
Chapter 4 Water Resources	--
Chapter 5 Water Quality	005 Permits to construct, modify, or operate a facility
Chapter 6 Water Wells	--
Chapter 8 Public Water Supply	100 Design, construction and approval of facilities Booklet for Sewer Construction.

5-7.3.13.1 The following is Kentucky Regulations Order Form:

<http://www.nr.state.ky.us/nrepc/dep/waste/forms/regorder.pdf>

5-7.3.14 The following is Kentucky Construction Permit Application for Sewer Line Extension:

<http://water.nr.state.ky.us/dow/app-sle2.pdf>

[Back to Paragraph 5-7.3.5](#)

5-7.3.15 The following is Kentucky Water Line Submittal Checklist:

<http://water.nr.state.ky.us/dow/checklist.pdf>

[Return to paragraph 5-7.3.9](#)

[Return to Chapter 2](#)

[Return to Water Distribution System Designer Instructions](#)

[Return to Sewer Designer Instructions](#)

APPENDIX C

Digging / Excavation Permits

These permits are found on the following 3 pages

[Return to Chapter 2](#)

DIGGING PERMIT

(The proponent for this form is DPW)

NAME AND TITLE OF PROJECT OFFICER / REQUESTER	DATE
ORGANIZATION OF REQUESTER	TELEPHONE
LOCATION OF PROPOSED EXCAVATION <i>(Attach copy of approved work request or plan)</i>	PROJECTED WORK DATE(S)
PURPOSE OF EXCAVATION <i>(Project Number / Contract Number / Title / Etc.)</i>	

PART I (Utilities Coordination)

Digging or excavation work is a requirement within the scope of work to be accomplished. I understand:

- * DPW environmental coordination not required for housing occupants.
- * My responsibilities in relation to safety, property damage, personal injury and life threatening hazards associated with digging in the vicinity of underground utilities. Verbal approvals may be given by entities on this form. I understand these approvals are based on information I provide.
- * Underground utilities which may be encountered while performing digging and excavation work are high voltage electrical cables, high pressure lines, water lines, sewer lines, steam lines, liquid fuel lines, telephone cables, control cables, and refrigerant lines. Digging into any of these lines could result in extensive property damage. Severe injury or death could result from digging into electrical cables, gas lines, liquid fuel lines, and other high pressure lines. I am responsible for any damages caused to persons or property as a result of my fault or negligence.
- * All known underground utilities within the project limits will be discussed with me or my representative during the course of this coordination. Exact location may be unknown; therefore, I am responsible for performing such work as may be necessary to determine exact locations. When calling TENNESSEE ONE CALL and KENTUCKY BUD, advise them the locate request is for Fort Campbell, KY (Government Reservation), not county.
- * I understand that it is my responsibility to notify the appropriate personnel listed below and request locating and marking underground utilities, and have each person initial this form.
- * Please allow a minimum of 3 working days for DPW personnel to locate and mark all utilities in your project area, and 10 workdays for communications lines. Housing area residents are not required to obtain initials for blocks 3, 8, 9, 11, 12 and 13.
- * Excavation shall not begin until I receive a signed copy of this form from DPW, Contract Management, or their designated representative.
- * A copy of this signed form shall be on the job site at all times.

SIGNATURE OF REQUESTER

All known underground utilities within the project limits have been discussed with the requester or the appropriate representative. Exact locations may not be known; however, the requester is responsible for performing such work as may be necessary to determine exact locations.

1. For location of post telephone lines or fiber optic cable, please bring this completed form to DOIM, Telecommunications Division, building 907, Bastogne Avenue, hours 0730 - 1630, (270-956-2201-798-9999).	INITIALS →	DOIM
2. For location of South Central Bell telephone lines in Housing Areas, contact Kentucky BUD (1-800-752-6007).	INITIALS →	SOUTH CENTRAL BELL
3. For location of selected telephone lines in the barracks area (3200, 3600, 3700, 4000, 6700, 6900, 7000, 7100, 7500 blocks), contact AT&T, Mr. Wayne Howes, telephone (270) 798-9200/(270)-698-1963. No AT&T utilities between Wickham and US 41A from 41st Street to the south end of Fort Campbell.	INITIALS →	BARRACKS TELEPHONE
4. For marking and clearance of underground TV cable, contact Mr. James Phillips or Mr. Gerald Schneider at COMCAST, telephone (931) 431-5633.	INITIALS →	CABLE TV
5. For marking of miscellaneous underground utilities such as, steam, chill water lines call DPW Work Order section 798-1200 (bldg 863, MON-FRI, 0730-1600).	INITIALS →	DPW, MISC UTILITIES
6. For marking of GAS, in housing areas call "TN ONE CALL" 1-800-351-1111. Construction contractors may call 931-542-9600.	INITIALS →	CLARKSVILLE GAS
7. For marking of underground electrical distribution, call DPW Work Order section, 798-1600 (bldg 863, MON-FRI, 0730-1600). Note: Coordinate with G3, Range Control, for electric down range on training ranges.	INITIALS →	DPW ELECTRIC
8. Underground control cables at CAAF. Cables are located outside of Perimeter Road around CAAF. Contact ATC/Joe Wooten at 798-6520/3028.	INITIALS →	ATC
9. For location of underground POL lines at SABRE/CAAF airfields and motor pools call (270)-798-6691.	INITIALS →	DPW LIQUID FUELS
10. For marking of underground water and sewer call CH2MHill call (931) 431- 5677.	INITIALS →	WATER & SEWER

(PART II (Environmental Coordination)

The requester will observe and enforce the following requirements:

- * Inspection of the proposed sites shall be conducted by Directorate of Public Works (DPW) if archeological area is incomplete, or the archeological survey identifies the proposed sites as high risk (where finding of archeological resources is probable). Records of archeological surveys are maintained at DPW, Environmental Division.
- * DPW shall monitor the excavation process in high risk areas (where finding of archeological resources is probable).
- * If archeological resources are discovered during the course of excavation, this coordination becomes invalid. Excavation or disturbance of site shall be suspended and DPW shall be notified immediately. DPW will evaluate significance of the finding and issue new guidance.
- * Solid Waste Management Units (SWMU) have been identified across Fort Campbell (to include the entire CAAF area). SWMUs usually require special instructions that may be provided during the course of this digging permit coordination. I realize I shall follow that guidance. All excavations in and/or near Solid Waste Management Units (SWMUs) must be coordinated with the Restoration Program Manager, 798-9768.
- * All work at CAAF must be coordinated with the Restoration Program Manager, 798-9768.
- * If potentially contaminated earth (unusual odor or appearance) is discovered during excavation, cease work immediately and contact the Restoration (SWMU) Program Manager, 798-9768.

SIGNATURE OF REQUESTER

11. ARCHEOLOGY (*MABRY HOUSE Bldg. 6081, 798-7437*).

INITIALS



ARCHEOLOGY

12. LAND MANAGEMENT (*Conservation Branch, Bldg. 2159, 798-9858*).

INITIALS



LAND MANAGEMENT

13. SWMU (*Restoration Program Manager, Bldg. 2186, 798-9768*).

INITIALS



SWMU

Remarks:

if work is not started within 30 days after permit issue, the digging permit will be null and void.

SIGNATURE OF CHIEF, DPW, CONTRACT MANAGEMENT (*Bldg. 846, 270-798-5514*)

DATE

COORDINATION FOR REAR AREA EXCAVATION

(The proponent of this form is PWBC)

NAME, RANK, AND TITLE OF REQUESTER	DATE
ORGANIZATION OF REQUESTER	TELEPHONE NUMBER
LOCATION OF PROPOSED EXCAVATION (<i>Attach map or overlay as appropriate</i>).	PROJECTED WORK DATE(S)
PURPOSE OF EXCAVATION (<i>Project Number / Contract Number / Title / Etc.</i>).	
<p>The requester will observe and enforce the following requirements:</p> <ul style="list-style-type: none"> * Excavation shall not begin before completion of this coordination. * Inspection of the proposed sites shall be conducted by Public Works Business Center (PWBC) if archaeological survey of the area is incomplete, or the archaeological survey identifies the proposed sites as high risk (where finding of archaeological resources is probable). Records of archaeological surveys are maintained at PWBC, Environmental Division. * PWBC shall monitor the excavation process in high risk areas (where finding of archaeological resources is probable). * If archaeological resources are discovered during the course of an excavation, this coordination becomes invalid. Excavation or disturbance of the site shall be suspended and PWBC shall be notified immediately. PWBC will evaluate the significance of the finding and issue new guidance. * Excavation sites shall be restored upon termination of usefulness, unless otherwise coordinated with PWBC. * Solid Waste Management Units (SWMU) have been identified across Fort Campbell (to include the entire CAAF area). SWMUs usually require special instructions that may be provided during the course of this digging permit coordination. I realize I shall follow that guidance. All excavations in and/or near Solid Waste Management Units (SWMUs) must be coordinated with the Restoration Program Manager, 798-9768. * All work at CAAF must be coordinated with the Restoration Program Manager, 798-9768. * If potentially contaminated earth (unusual odor or appearance) is discovered during excavation, cease work immediately and contact the Restoration (SWMU) Program Manager, 798-9768. 	
SIGNATURE OF REQUESTER	
1. For location of post telephone lines or fiber optic cable, please bring this completed form to ITBC, Telecommunications Division, Bldg. 907 Bastogne Ave, hours 0730-1630, 798-9650.	INITIALS
2. For location of underground electric distribution, contact Mr. Tommy Dunn, telephone (270) 798-2119. Note: coordinate with G3, Range Control, for electric down range on training areas.	INITIALS
3. ARCHEOLOGY (<i>Mabry House Bldg. 6801, 798-7437</i>).	INITIALS
4. LAND MANAGEMENT (<i>Conservation Branch Bldg. 2159, 798-9824/9850</i>).	INITIALS
5. SWMU (<i>Restoration Program Manager, Bldg. 2186, 798-9768</i>).	INITIALS
In accordance with CAM Regulation 420-3, if work is not started within 30 days after permit issue, this permit is null and void.	
SIGNATURE OF NEPA PROGRAM MANAGER (<i>Bldg. 2159, 13 1/2 Street, 798-9824/9825</i>)	DATE

APPENDIX D

Exterior Finishes

The following are Ft. Campbell's standard color schedule exterior finishes and special items:

X1 Brick

Manufacturer: Taylor Clay Products
Pattern/Style: Grade SW ASTM 216
Color: 370 (80%), 371 (20%)
Autumn Blend
Mortar: X2

X2 Split Faced CMU

Manufacturer: Lee Masonry
Color: Buff

X3 Mortar

Manufacturer: Kosmo Cement Co.
Pattern/Style: Kosmortar
Color: 1 Ochre

X4 Standing Seam Metal Roof & Fascia

Manufacturer: Butler-Cote
Pattern/Style: 500 FP
Color: Chestnut Brown

X5 Roof Fixtures

Manufacturer: Varies
Color: Match Item X4

X6 Exterior Doors, Frames & Trim & Anodized Aluminum Windows

Manufacturer: Varies
Color: Match Item X4

X7 Downspouts, Gutters, Louvers, Flashing

Manufacturer: Varies
Factory Color: Match Item X4

X8 Exterior Soffits & Ceiling

Color: White
Remarks: Factory Finish

[Return to Finishes](#)
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APPENDIX E

Fort Campbell Landscape Plant List

Native Plant Material

(Native) Conifers/Evergreens:

Botanical Name	Common Name
(Native) Tall Trees – (trees over 50 ft. at maturity)	
<i>Pinus echinata</i>	Shortleaf Pine
<i>Tsuga canadensis</i>	Eastern Hemlock
<i>Taxodium distichum</i>	Bald Cypress
(Native) Medium Trees – (trees 25 to 50 ft. at maturity)	
<i>Pinus virginiana</i>	Virginia Pine
<i>Juniperus virginiana</i>	Eastern Red Cedar
(Native) Small Trees/Large Shrubs – (10 to 25 ft. at maturity)	
<i>Juniperus virginiana</i>	Eastern Red Cedar

[Return to Exterior Planting Section](#)

(Native) Deciduous:

Botanical Name	Common Name
(Native) Tall Trees– (trees over 50 ft. at maturity)	
<i>Liriodendron tulipifera</i>	Yellow or Tulip Poplar
<i>Sassafras albidum</i>	Sassafras
<i>Liquidambar styraciflua</i>	Sweetgum
<i>Ulmus thomasii</i>	Rock Elm
<i>Celtis occidentalis</i>	Hackberry
<i>Celtis laevigata</i>	Sugarberry
<i>Morus rubra</i>	Red Mulberry
<i>Juglans nigra</i>	Black Walnut
<i>Carya illinoensis</i>	Pecan
<i>Carya cordiformis</i>	Bitternut Hickory
<i>Carya tomentosa</i>	Mockernut Hickory
<i>Carya ovata</i>	Shagbark Hickory
<i>Carya glabra</i>	Pignut Hickory
<i>Fagus grandifolia</i>	American Beech

Botanical Name	Common Name
(Native) Tall Trees– (trees over 50 ft. at maturity) continued	
<i>Quercus alba</i>	White Oak
<i>Quercus stellata</i>	Post Oak
<i>Quercus bicolor</i>	Swamp White Oak
<i>Quercus michauxii</i>	Swamp Chestnut Oak
<i>Quercus prinus</i>	Chestnut Oak
<i>Quercus muehlenbergii</i>	Chinkapin Oak
<i>Quercus rubra</i>	Northern Red Oak
<i>Quercus palustris</i>	Pin Oak
<i>Quercus falcata</i>	Southern Red Oak
<i>Quercus velutina</i>	Black Oak
<i>Quercus shumardii</i>	Shumard Oak
<i>Quercus coccinia</i>	Scarlet Oak
<i>Quercus phellos</i>	Willow Oak
<i>Tilia americana</i>	American Basswood
<i>Populus deltoides</i>	Eastern Cottonwood
<i>Salix nigra</i>	Black Willow
<i>Diospyros virginiana</i>	Common Persimmon
<i>Prunus serotina</i>	Black Cherry
<i>Gleditsia tracanthos</i>	Honeylocust
<i>Gymnocladus dioica</i>	Kentucky Coffeetree
<i>Nyssa aquatica</i>	Water Tupelo
<i>Nyssa sylvatica</i>	Black Tupelo
<i>Aesculus octandra</i>	Yellow Buckeye
<i>Acer rubrum</i>	Red Maple
<i>Acer saccharinum</i>	Silver Maple
<i>Acer negundo</i>	Box Elder
<i>Fraxinus pennsylvanica</i>	Green Ash
<i>Fraxinus americana</i>	White Ash
(Native) Medium Trees – (trees 25 to 50 ft. at maturity)	
<i>Magnolia tripetala</i>	Umbrella Magnolia
<i>Magnolia macrophylla</i>	Bigleaf Magnolia
<i>Asimina triloba</i>	Pawpaw
<i>Ulmus alata</i>	Winged Elm
<i>Celtis occidentalis</i>	Hackberry
<i>Quercus stellata</i>	Post Oak
<i>Quercus marilandica</i>	Blackjack Oak
<i>Ostrya virginiana</i>	Eastern Hop Hornbeam
<i>Carpinus carolinia</i>	American Hornbeam
<i>Betula lenta</i>	Sweet Birch
<i>Betula nigra</i>	River Birch
<i>Salix nigra</i>	Black Willow
<i>Oxydendron arboreum</i>	Sourwood
<i>Diospyros virginiana</i>	Common Persimmon
<i>Halesia carolina</i>	Carolina Silverbell

Botanical Name	Common Name
(Native) Medium Trees – (trees 25 to 50 ft. at maturity) continued	
<i>Amelanchier arborea</i>	Downey Serviceberry
<i>Ilex opaca</i>	American Holly
<i>Rhamnus caroliniana</i>	Carolina Buckthorn
<i>Aesculus glabra</i>	Ohio Buckeye
<i>Acer negundo</i>	Box Elder
(Native) Small Trees/Large Shrubs – (10 to 25 ft. at maturity)	
<i>Hamamelis virginiana</i>	Witch Hazel
<i>Carpinus carolinia</i>	American Hornbeam
<i>Kalmia latifolia</i>	Mountain Laurel
<i>Prunus americana</i>	American Plum
<i>Crataegus spp.</i>	Hawthorn
<i>Cercis canadensis</i>	Eastern Redbud
<i>Cornus florida</i>	Flowering Dogwood
<i>Euonymus atropurpurens</i>	Eastern Wahoo
<i>Cephalanthus occidentalis</i>	Buttonbush
<i>Sambucus canadensis</i>	American Elder

[Return to Exterior Planting Section](#)

Introduced Species (Kentucky Extension Service List)

(Introduced) Evergreen:

Botanical Name	Common Name
(Introduced) Tall Trees– (trees over 50 ft. at maturity)	
<i>Abies nordmanniana</i>	Nordmann Fir
<i>Cedrus libani</i> var. <i>stenocoma</i>	Hardy Cedar of Lebanon
<i>Picea abies</i>	Norway Spruce
<i>Picea glauca</i> 'Densata'	Black Hills Spruce
<i>Picea omorika</i>	Serbian Spruce
<i>Picea orientalis</i>	Oriental Spruce
<i>Picea pungens</i>	Colorado Spruce
<i>Pinus densiflora</i>	Japanese Red Pine
<i>Pinus flexilis</i>	Limber Pine
<i>Pinus resinosa</i>	Red Pine
<i>Pseudotsuga menziesii</i>	Douglas Fir
<i>Thuja occidentalis</i>	American Arborvitae
(Introduced) Medium Trees – (trees 25 to 50 ft. at maturity)	
<i>Abies concolor</i>	White Fir
<i>Chamaecyparis obtusa</i>	Hinoki Cypress
<i>Chamaecyparis pisifera</i>	Thread Cypress
<i>Ilex attenuata</i> 'Fosteri'	Foster No. 2 Holly
<i>Juniperus chinensis</i>	Chinese Juniper
<i>Osmanthus americanus</i>	Devil Wood

Botanical Name	Common Name
(Introduced) Medium Trees – (trees 25 to 50 ft. at maturity) continued	
<i>Pinus bungeana</i>	Lacebark Pine
<i>Pinus cembra</i>	Swiss Stone Pine
<i>Pinus densiflora</i> 'Oculus-draconis'	Japanese Red Pine
<i>Pinus strobus</i> 'Fastigiata'	Columnar White Pine
<i>Pinus strobus</i> 'Pendula'	Weeping White Pine
<i>Pinus sylvestris</i>	Scotch Pine
<i>Platycladus orientalis</i>	Oriental Arborvitae
<i>Taxus baccata</i>	English Yew
<i>Taxus cuspidata</i> 'Capitata'	Upright Japanese Yew
(Introduced) Small Trees/Large Shrubs – (10 to 25 ft. at maturity)	
<i>Abies koreana</i> 'Prostrate Beauty'	Prostrate Korean Fir
<i>Chamaecyparis obtusa</i> 'Torulosa'	Contorted Hinoki Cypress
<i>Ilex aquifolium</i>	English Holly
<i>Ilex crenata</i> 'Noble's Upright'	Noble's Upright Japanese Holly
<i>Ilex pedunculosa</i>	Longstock Holly
<i>Juniperus chinensis</i>	Chinese Juniper
<i>Juniperus scopulorum</i>	Rocky Mountain Juniper
<i>Picea glauca</i> 'Conica'	Dwarf Albert Spruce
<i>Pinus densiflora</i> 'Umbraculifera'	Tanyosho Pine
<i>Pinus mugo</i>	Mugho Pine
<i>Pinus strobus</i> 'Contorta'	Curly White Pine
<i>Pinus sylvestris</i> 'Wateri'	Waterer's Scotch Pine
<i>Rhododendron catawbiense</i>	Rhododendron
<i>Rhododendron azalea</i>	Azalea
<i>Rhododendron maximum</i>	Rosebay Rhododendron
<i>Sciadopitys verticillata</i>	Umbrella Pine
<i>Taxus cuspidata</i>	Japanese Yew
<i>Viburnum pragense</i>	Fragrant Viburnum
(Introduced) Medium Shrubs – (6 to 8 ft. at maturity)	
<i>Chamaecyparis obtusa</i> 'Sanderi'	Sanderi Hinoki False Cypress
<i>Chamaecyparis pisifera</i>	Sawara Cypress
<i>Ilex meserveae</i>	Blue Holly
<i>Juniperus chinensis</i> 'Sea Green'	Sea Green Chinese Juniper
<i>Mahonia aquifolium</i>	Oregon Holly Grape
<i>Pieris japonica</i>	Japanese Pieris
<i>Taxus cuspidata</i>	Japanese Yew
<i>Taxus media</i>	Spreading Yew
(Introduced) Small Shrubs – (4 to 5 ft. at maturity)	
<i>Buxus microphylla</i>	Boxwood
<i>Chamaecyparis pisifera</i>	Gold Thread Cypress
<i>Ilex glabra</i> 'Compacta'	Compact Inkberry
<i>Ilex opaca</i> 'Maryland Dwarf'	Maryland Dwarf American Holly
<i>Juniperus chinensis</i>	Chinese Juniper

Botanical Name	Common Name
(Introduced) Small Shrubs – (4 to 5 ft. at maturity) continued	
<i>Leucothoe fontanesiana</i>	Drooping Leucothoe
<i>Mahonia aquifolium</i>	Oregon Holly Grape
<i>Picea abies</i>	Norway Spruce
<i>Picea pungens</i>	Colorado Spruce
<i>Pinus mugo</i>	Mugho Pine
<i>Pinus strobus</i> 'Nana'	Dwarf White Pine
<i>Pinus sylvestris</i> 'Beuvronensis'	Dwarf Scotch Pine
<i>Rhododendron</i> 'Starry Night'	Starry Night Rhododendron
<i>Taxus baccata</i> 'Repandens'	Spreading English Yew
<i>Tsuga canadensis</i> 'Gentsch'	Gentsch White Canadian Hemlock
(Introduced) Low Shrubs – (2 to 3 ft. at maturity)	
<i>Abies balsamea</i> 'Nana'	Dwarf Balsam Fir
<i>Chamaecyparis obtusa</i> 'Pygmae	Dwarf Hinoki False Cypress
Aurescens'	
<i>Chamaecyparis pisifera</i>	Moss Cypress
<i>Juniperus horizontalis</i>	Compact Juniper
<i>Juniperus sabina</i>	Savin Juniper
<i>Juniperus squamata</i> 'Blue Star'	Blue Star Juniper
<i>Leucothoe fontanesiana</i>	Drooping Leucothoe
<i>Mahonia aquifolium</i> 'Compactum'	Compact Oregon Holly Grape
<i>Picea abies</i>	Dwarf Norway Spruce
<i>Pieris japonica</i> 'Pygmaea'	Pygmy Andromeda
<i>Pinus sylvestris</i> 'Riverside Gem'	Riverside Gem Scotch Pine
<i>Rhododendron obtusum</i>	Azalea (several varieties)

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**(Introduced)
Deciduous:**

Botanical Name	Common Name
(Introduced) Tall Trees– (trees over 50 ft. at maturity)	
<i>Acer platanoides</i>	Norway Maple
<i>Alnus glutinosa</i>	European Alder
<i>Cercidiphyllum japonicum</i>	Katusra Tree
<i>Eucommia ulmoides</i>	Hardy Rubber Tree
<i>Fagus sylvatica</i>	European Beech
<i>Ginkgo biloba</i>	Ginkgo or Maidenhair Tree
<i>Larix kaempferi</i>	Japanese Larch
<i>Metasequoia glyptostroboides</i>	Dawn Redwood
<i>Platanus x acerfolia</i>	London Planetree
<i>Quercus acutissima</i>	Sawtooth Oak
<i>Quercus robur</i>	English Oak
<i>Tilia cordata</i>	European Linden

Botanical Name	Common Name
(Introduced) Tall Trees– (trees over 50 ft. at maturity) continued	
<i>Tilia tomentosa</i>	Silver Linden
<i>Ulmus parvifolia</i>	Chinese Elm
<i>Ulmus x</i>	Hybrid Elms
<i>Zelkova serrata</i>	Japanese Zelkova
(Introduced) Medium Trees – (trees 25 to 50 ft. at maturity)	
<i>Acer campestre</i>	Hedge Maple
<i>Acer griseum</i>	Paperbark Maple
<i>Aesculus x carnea</i>	Red Horsechestnut
<i>Aesculus pavia</i>	Red Buckeye
<i>Amelanchier grandiflora</i>	Apple Serviceberry
<i>Amelanchier laevis</i>	Alleghany Serviceberry
<i>Betula populifolia</i>	Gray Birch
<i>Betula maximowicziana</i>	Monarch Birch
<i>Carpinus betulus</i>	European Hornbeam
<i>Castanea mollissima</i>	Chinese Chestnut
<i>Corylus colurna</i>	Turkish Filbert
<i>Franklinia alatamaha</i>	Franklin Tree
<i>Ilex decidua</i>	Possum Haw
<i>Koeireuteria paniculata</i>	Golden Raintree
<i>Larix decidua</i> 'Pendula'	Weeping European Larch
<i>Maackia amurensis</i>	Amur Maackia
<i>Magnolia virginiana</i>	Sweet Bay Magnolia
<i>Phellodendron amurense</i>	Cork Tree
<i>Prunus sargentii</i>	Sargent Cherry
<i>Prunus serrulata</i> 'Kwanzan'	Kwanzan Japanese Cherry
<i>Pyrus fauriei</i>	Korean Pear
<i>Stewartia pseudocamellia</i>	Japanese Stewartia
<i>Syringa pekinensis</i>	Pekin Lilac
<i>Syringa reticulata</i>	Japanese Tree Lilac
<i>Prunus x yedoensis</i>	Yoshino Cherry
<i>Pyrus calleryana</i>	Callery Pear
(Introduced) Small Trees/Large Shrubs – (10 to 25 ft. at maturity)	
<i>Acer buergeranum</i>	Trident Maple
<i>Acer ginnala</i>	Amur Maple
<i>Acer japonicum</i>	Fullmoon Maple
<i>Acer maximowiczianum</i>	Nikko Maple
<i>Acer palmatum</i>	Japanese Maple
<i>Acer tegmentosum</i>	Manchu Striped Maple
<i>Aesculus parviflora</i>	Bottlebrush Buckeye
<i>Buddleia alternifolia</i>	Fountain buddiela
<i>Cercidiphyllum japonicum</i>	Weeping Katsura Tree
<i>Chionanthus retusus</i>	Chinese Fringe Tree
<i>Chionanthus virginicus</i>	Fringe Tree
<i>Cornus alternifolia</i>	Pagoda Dogwood

Botanical Name	Common Name
(Introduced) Small Trees/Large Shrubs – (10 to 25 ft. at maturity) continued	
<i>Cornus kousa</i>	Kousa Dogwood
<i>Cornus mas</i>	Cornelian Cherry Dogwood
<i>Cornus officinalis</i>	Japanese Cornel Dogwood
<i>Cornus racemosa</i>	Gray Dogwood
<i>Corylus avellana</i> 'Cortorta'	Curly European Filbert
<i>Corylus maxima</i> 'Purpurea'	Purple Giant Filbert
<i>Cotoneaster multiflorus</i>	Many-flowered Cotoneaster
<i>Crataegus crus-galli</i>	Cockspur Hawthorn
<i>Crataegus lavalleyi</i>	Lavalle Hawthorn
<i>Crataegus phaenopyrum</i>	Washington Hawthorn
<i>Crataegus viridis</i> 'Winter King'	Winter King Hawthorn
<i>Deutzia scabra</i> 'Pride of Rochester'	Pride of Rochester Deutzia
<i>Enkianthus campanulatus</i>	Redvein Enkianthus
<i>Euonymus alata</i>	Burning Bush
<i>Forsythia intermedia</i>	Border Forsythia
<i>Fothergilla major</i>	Large Fothergilla
<i>Ilex verticillata</i>	Winterberry
<i>Kolkwitzia amabilis</i>	Beauty Bush
<i>Ligustrum ibolium</i>	Ibolium Privet
<i>Ligustrum ovalifolium</i>	California Privet
<i>Ligustrum vicaryi</i>	Vicary Golden Privet
<i>Lindera benzoin</i>	Spicebush
<i>Lonicera morrowii</i>	Fragrant Honeysuckle
<i>Lonicera tatarica</i>	Tatarian Honeysuckle
<i>Magnolia x</i>	Hybrid Magnolia (several varieties)
<i>Magnolia loebneri</i> 'Merrill'	Dr. Merrill Magnolia
<i>Magnolia soulangiana</i>	Saucer Magnolia
<i>Magnolia stellata</i>	Star Magnolia
<i>Malus x spp.</i>	Crabapple
<i>Malus floribunda</i>	Flowering Crabapple
<i>Malus sieboldii</i> var. Zumi	Calocarpa Crabapple
<i>Philadelphus virginialis</i>	Mockorange
<i>Physocarpus opulifolius</i>	Eastern Ninebark
<i>Prunus x</i> 'Hally Jolivette'	Hally Jolivette Cherry
<i>Prunus subhirtella</i>	Higan Cherry
<i>Rhamnus fragula</i> 'Asplenifolia'	Cutleaf Buckthorn
<i>Syringa vulgaris</i>	Common Lilac
<i>Ulmus glabra</i> 'Camperdownii'	Camperdown Elm
<i>Viburnum burkwoodii</i>	Burkwood Viburnum
<i>Viburnum carlcephalum</i>	Fragrant Viburnum
<i>Viburnum dentatum</i>	Arrowwood Viburnum
<i>Viburnum dilatatum</i> 'Iroquois'	Iroquois Linden Viburnum
<i>Viburnum lantana</i>	Wayfaring Tree
<i>Viburnum lentago</i>	Nannyberry Viburnum
<i>Viburnum macrocephalum</i>	Chinese Snowball Viburnum

Botanical Name	Common Name
(Introduced) Small Trees/Large Shrubs – (10 to 25 ft. at maturity) continued	
<i>Viburnum opulus</i>	Cranberry Bush Viburnum
<i>Viburnum plicatum</i> var. <i>tomentosum</i> '	Doublefile Viburnum
<i>Viburnum prunifolium</i>	Blackhaw
<i>Viburnum rhytidophylioides</i>	Lantanaphyllum Viburnum
<i>Viburnum sargentii</i> 'Onondaga'	Onondaga Viburnum
<i>Viburnum sieboldii</i> 'Seneca'	Seneca Viburnum
<i>Viburnum setigerum</i>	Tea Viburnum
<i>Viburnum</i> 'Sesquehana'	Sesquehanna Viburnum
(Introduced) Medium Shrubs – (6 to 8 ft. at maturity)	
<i>Acanthopanax sieboldianus</i>	Five-leaved Aralia
<i>Acer palmatum</i>	Japanese Maple
<i>Aronia arbutifolia</i> 'Brilliantissima'	Brilliant Red Chokeberry
<i>Berberis mentorensis</i>	Mentor Barberry
<i>Berberis thunbergii</i>	Japanese Barberry
<i>Buddleia davidii</i>	Orange-eyed Butterfly Bush
<i>Calycanthus floridus</i>	Carolina Allspice
<i>Cercis chinensis</i>	Chinese Redbud
<i>Chaenomeles speciosa</i>	Flowering Quince
<i>Clethra alnifolia</i>	Summer Sweet
<i>Cornus alba</i>	Tatarian Dogwood
<i>Cornus baileyi</i>	Bailey's Dogwood
<i>Cornus florida</i> 'Pygmaea'	Pygmy Dogwood
<i>Cornus sericea</i> 'Flaviramea'	Yellow-twigg Dogwood
<i>Cotoneaster divaricata</i>	Spreading Cotoneaster
<i>Deutzia lemoinei</i>	Slender Deutzia
<i>Forsythia intermedia</i> 'Sunrise'	Border Forsythia
<i>Hamamelis vernalis</i>	Vernal Witchhazel
<i>Hibiscus syriacus</i>	Rose of Sharon
<i>Hydrangea quercifolia</i>	Oakleaf Hydrangea
<i>Ilex verticillata</i>	Winterberry
<i>Kerria japonica</i>	Japanese Kerria
<i>Ligustrum vulgare</i> 'Lodense'	Lodense Privet
<i>Lonicera xyldosteum</i> 'Claveyl'	Clavey's Honeysuckle
<i>Malus sargentii</i>	Sargent Crabapple
<i>Morus alba</i> 'Pendula'	Weeping Mulberry
<i>Myrica pensylvanica</i>	Northern Bayberry
<i>Prunus x cistena</i>	Purpleleaf Sand Cherry
<i>Pyracantha coccinea</i>	Scarlet Firethorn
<i>Rhus aromatica</i>	Fragrant Summac
<i>Ribes alpinum</i>	Alpine Currant
<i>Spiraea nipponica</i> 'Snowmound'	Snowmound Spirea
<i>Spiraea x vanhouttei</i>	Vanhoutte Spirea
<i>Viburnum acerfolium</i>	Mapleleaf Viburnum
<i>Viburnum carlesli</i>	Koreanspice
<i>Viburnum juddii</i>	Judd Viburnum

Botanical Name	Common Name
(Introduced) Medium Shrubs – (6 to 8 ft. at maturity) continued	
<i>Viburnum x 'Mohawk'</i>	Mohawk Viburnum
<i>Viburnum x pragense</i>	Prague Viburnum
<i>Weigela florida</i>	Weigela
(Introduced) Small Shrubs – (4 to 5 ft. at maturity)	
<i>Abelia grandiflora</i>	Glossy Abelia
<i>Berberis thunbergii</i> 'Aurea'	Golden Japanese Barberry
<i>Cotoneaster horizontalis</i>	Rockspray Cotoneaster
<i>Deutzia gracilis</i>	Slender Deutzia
<i>Divervilla sessilifolia</i>	Southern Bush Honeysuckle
<i>Hydrangea arborescens</i>	Hills-of-Snow
<i>Hypericum kalm</i>	Kalm St. Johnswort
<i>Ilex verticillata</i>	Winterberry
<i>Itea japonica</i> 'Beppu'	Beppu Sweetspire
<i>Malus sargentii</i> 'Tina'	Tina Crabapple
<i>Physocarpus opulifolius</i>	Eastern Ninebark
<i>Potentilla fruticosa</i>	Bush Cinquefoil
<i>Pyracantha coccinea</i>	Scarlet Firethorn
<i>Syringa meyeri</i> 'Palibin'	Meyer's Lilac
<i>Syringa patula</i> 'Miss Kim'	Littleleaf Lilac
<i>Viburnum opulus</i> 'Nana'	Dwarf Cranberrybush Viburnum
<i>Viburnum trilobum</i> 'Compactum'	Compact American Cranberry Bush
<i>Viburnum utile</i> 'Eskimo'	Eskimo Viburnum
(Introduced) Low Shrubs – (2 to 3 ft. at maturity)	
<i>Berberis thunbergii</i>	Japanese Barberry
<i>Caryopteris clandonensis</i> 'Blue	Blue Mist Bluebeard
<i>Cornus sericea</i> 'Kelseyi'	Kelsey's Dwarf Dogwood
<i>Cotoneaster apiculatus</i>	Cranberry Cotoneaster
<i>Cotoneaster dammeri</i>	Bearberry Cotoneaster
<i>Cotoneaster horizontalis</i> 'Perpusilla'	Perpusilla Rock Cotoneaster
<i>Cotoneaster microphylla</i>	Small Leaf Cotoneaster
<i>Forsythia viridissima</i> 'Bronxensis'	Bronx Forsythia
<i>Forsythia</i> 'Arnold's Dwarf'	Arnold's Dwarf Forsythia
<i>Fothergilla gardenii</i>	Dwarf Fothergilla
<i>Hypericum</i> 'Hidcote'	Hidcote St. Johnswort
<i>Jasminum nudiflorum</i>	Winter Jasmine
<i>Kalmia cuseata</i> 'White Wicky'	White Wicky Mountain Laurel
<i>Kerria japonica</i> 'Picta'	Variegated Japanese Kerria
<i>Physocarpus opulifolius</i> 'Nana'	Dwarf Eastern Ninebark
<i>Rhus aromatica</i> 'Gro-low'	Gro-low Fragrant Summac
<i>Ribes alpinum</i> 'Greenmound'	Greenmound Alpine Currant
<i>Rosa wichuriana</i>	Memorial Rose
<i>Spiraea x bumalda</i>	Bumald Spirea
<i>Spiraea japonica</i> 'Little Princess'	Little Princess Japanese Spirea
<i>Symphoricarpos albus</i>	Snowberry
<i>var. laevigatus</i>	

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Appendix F

Utility Procedures

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F-3	<u>Metering</u>
F-4	<u>Distribution Lines</u>
F-5	<u>Existing Lines to be Removed</u>
F-6	<u>New Service Lines</u>
F-7	<u>Plans and Specifications</u>
F-8	<u>Utility Cost Estimate</u>
F-9	<u>Utility Company Contracts</u>

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APPENDIX F

Utility Procedures

F-1 INTRODUCTION:

The natural gas distribution system, the water distribution system for domestic and fire, and the sewer systems at Fort Campbell are now privately owned and operated by utility companies.

This is an outline of the recommended procedures for dealing with the utility aspects of facility design projects. Variation from this procedure is expected, depending upon the project. However, revised procedures should be agreed upon during the early design stages of a project. Unless noted otherwise in the design scope of work, the utility companies will install new service lines to buildings.

The utility companies are active players in the planning, design, and construction process of each building project.

Utility company contacts are provided below.

F-2 RECORD DRAWINGS:

The utility companies maintain as-built record utility drawings for the installation. To obtain utility drawings, refer to UTILITY COMPANY CONTACTS below.

F-3 METERING:

Metering of gas, steam, heating hot water, electricity, fuel oil, etc. is required by UFC 3-400-01 Energy Conservation.

Metering of water is required for all buildings where potable water demand is estimated to exceed 100,000 gallons per year.

Connection of the meters to the Energy Monitoring and Control System (EMCS) is required.

The gas utility company will install a regulator, an emergency gas connection, a seismic shutoff valve, and a meter with a pulse initiator for EMCS. [A typical gas service meter assembly at the building is attached for information.](#) Coordinate the location of this assembly with the utility company and show the location on the drawings and indicate that the installation is by the gas utility company.

Where required, a building domestic water meter will be provided inside the building mechanical room by the water company. Coordinate the location of this meter with the utility company and show the location on the drawings and indicate that the installation is by the water utility company.

The fire sprinkler water will not be metered.

F-4 DISTRIBUTION LINES:

The utility company will determine whether changes to the utility distribution systems will be required. The cost, schedule, and execution of the upgrade to the distribution system will be handled by Fort Campbell and the utility company as a contract action separate from the building project.

F-5 EXISTING LINES TO BE REMOVED:

Unused lines will be removed by the utility company.

F-6 NEW SERVICE LINES:

The building designer determines the required capacity of each service line and the preferred location of the building service entrance.

The building designer determines the required gas pressure into the building (typically 14 inches water column).

The building designer obtains the installation utility record drawings (maps) from the utility company.

The building designer coordinates with the utility companies to determine and share the following information concerning the service lines:

- Flow
- Estimated consumption
- Line size
- Routing
- Tie-in points to the main distribution system
- Location of the utility service entrance to the building
- Location of the gas regulator / meter / emergency connection / seismic shutoff valve assembly
- Location of valves including the post indicator valve for the fire sprinkler system
- Location of the water meter

- The type of backflow preventer on the incoming domestic water service lines, usually a reduced pressure type
- The type of backflow preventer on the incoming fire sprinkler line, usually a double check type. However if there are additives such as antifreeze or foam in the system or if there is a second non-potable water source connected to the sprinkler system, a reduced pressure type is required.
- Location of existing utility lines to be removed

F-7 PLANS AND SPECIFICATIONS:

On the design drawings, the building designer shows:

- The routing of the new utility service lines, noted to be installed by others
- The location of building meters and regulator assemblies, noted to be installed by others
- The location of fire hydrants, noted to be installed by others
- The location of water line valves in the service lines, noted to be installed by others
- The location of post indicator valves, noted to be installed by others
- The location of utility lines to be removed, noted to be removed by others
- The main gas pressure
- The required building gas pressure
- The available static and residual water pressure and associated flow

Utility installation details are not shown.

Fire department connections are included in the contract as part of the sprinkler work.

The backflow preventers for domestic water and for fire sprinkler service are to be located inside the building and will be included in the building construction contract.

The building designer sends the design drawings to the utility companies. This should be done during concept design and during final design.

The utility company reviews the drawings and coordinates any required changes with the building designer.

The building designer includes a provision in the specifications that the building construction contractor must coordinate with the utility companies on the timing and sequence of work for the installation of the utilities. The utility contacts for utility work during construction below are to be included in the design documents.

The design documents must indicate that the utility company applies for all permits from the appropriate state authorities.

F-8 UTILITY COST ESTIMATE:

The building designer has no involvement in the gas and water utility cost estimate.

F-9 UTILITY COMPANY CONTACTS:

GAS:

To obtain record drawings, to discuss gas service line capacity, size, routing, and tie-in points to the main distribution system, and for coordination of gas utility work during construction or for inspection of contractor installed lines:

Randall Lewis
Clarksville Gas and Water Co.
Phone: 931-542-9600
Fax:

WATER AND SEWER:

To obtain water and sewer record drawings, to discuss water and sewer service line capacity, size, routing, and tie-in points to the main distribution system, and for coordination of water and sewer utility work during construction or for inspection of contractor installed lines:

Chris Semler
CH2M Hill Co.
Phone: 931-431-2015
Fax: 931-431-0952

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APPENDIX G

Mold and Humidity Control

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- G-2 [Building Envelope](#)
- G-3 [Tight Buildings](#)
- G-4 [Air Infiltration and Vapor Barriers](#)
- G-5 [Gypsum Board and Wall Finishes](#)
- G-6 [Attics](#)
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APPENDIX G

Mold and Humidity Control

G-1 INTRODUCTION:

Mold grows where mold spores, nutrients, correct temperature, and ample moisture are combined. Controlling moisture is the best approach to avoiding mold. Eliminating mold spores is impractical, the organic materials in buildings offer potential mold nutrients, and the temperature in buildings is conducive to mold growth. Thus minimizing moisture by eliminating leaks, drips, and condensation in the wrong places must be addressed. Undesired water and moisture usually comes from problems in either the building envelope or the building mechanical systems or both. Wet materials and surfaces are not always required for mold to grow. Even high humidity conditions contribute to mold growth. Air conditioning systems must be designed to keep space humidity at reasonable levels.

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G-2 BUILDING ENVELOPE

The design of the building envelope must consider removal of all air entry points, cold bridges, multiple vapor barriers and gaps in the insulation system. Attics (with exceptions) and crawl spaces should no longer be ventilated. Interior floor slabs should be separated from foundations by insulated expansion joint materials. Cavity wall insulation should extend down to the footings. Insulated windows should be aligned with cavity wall insulation to remove gaps in the insulation system. Window sills, foundation sills and other veneer wall features should be isolated from the structural backup wall allowing cavity wall insulation to run continuously. Use only thermally broken windows. When designing with metal stud backup wall, apply minimum 1' rigid insulation over exterior sheathing to improve thermal performance. Consider the use of new insulation products such as Polyisocyanurate which effectively eliminates air infiltration and vapor transmission.

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G-3 TIGHT BUILDINGS:

Leaks of unconditioned outdoor air bring moisture into the building and lead to condensation on cold surfaces with subsequent wetting of building materials followed by deterioration of the materials and mold growth. Therefore, buildings that are relatively air tight must be the goal. A ventilated attic directly over an insulated lay-in ceiling, for example, does not represent tight building construction. Keep in mind that a slight

pressure difference usually exists between inside and outside the building. Insulation batts alone will not stop air flow through the batt if a pressure difference exists from one side of the batt to the other and should therefore not be the only barrier to outdoor air. Mechanical air handling and exhaust systems are typically designed to bring in more air than they exhaust in attempt to pressurize the building to prevent infiltration of outdoor air. This pressurization however is impossible if the building is full of holes. Pay close attention to the details of construction where walls meet roof to eliminate sources of air leaks. Note that building air tightness is not the same as vapor tightness. Buildings may be designed with or without vapor barriers depending on the indoor and outdoor conditions; however, air tightness must always be the goal.

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G-4 AIR INFILTRATION AND VAPOR BARRIERS:

Recent studies have shown that air infiltration/exfiltration is a more significant source of moisture accumulation in walls than water vapor diffusion. Air infiltration barriers (such as Tyvek) resist entry of air in walls that can transport moisture and create condensation problems while allowing water vapor to escape. These barriers also resist wind blown rain and water while protecting wall sheathing.

The use of vapor barriers, vapor retarders, and perm ratings for construction materials in the building envelope must be carefully considered for use by the designer. Vinyl wall coverings, bituminous dampproofing, certain paint systems all have properties which may create vapor retarders. If used, vapor barriers must be placed at a location where the temperature is above the dewpoint temperature in both the heating and the cooling seasons. It is critical to eliminate multiple vapor retarders in wall systems which can trap moisture and create potential mold conditions.

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G-5 GYPSUM BOARD AND WALL FINISHES:

Do not place paper covered gypsum board or other surfaces that may provide nutrients for mold behind wall mounted fan coil units. Condensate drips from the valves and cold piping inside the fan coil cabinet and a small splash occurs with each drip. Because manufacturers provide no rear panel to the fan coil cabinet, the splashed droplets dampen the wall surface behind the fan coil unit. Conventional gypsum board material at this location insures mold growth. Provide a wall liner made of plastic, metal, or other material that will not be a nutrient source for mold behind wall mounted fan coil units.

Do not use vinyl wall coverings on the interior surfaces of exterior walls or wall surfaces opposite kitchens or shower rooms. Moisture from these high humidity spaces will be trapped and condense behind the vinyl.

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G-6 ATTICS:

Because mold is becoming more associated with the entry of moisture laden air in the building envelop, it is strongly recommended that ventilated attics be used only in limited applications. However, if an attic is ventilated, do not use a vapor barrier under the insulation installed on top of the ceiling. This is because in the cooling season, this puts the vapor barrier in a location made cold by air discharging from supply air diffusers.

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G-7 CRAWL SPACES:

Do not ventilate crawl spaces. Doing so introduces moisture to the crawl space which will migrate through floors and condense on the underside of floor coverings. The moisture can also condense on cold pipe surfaces within the crawl space; even the outer surface of the insulation on a chilled water line can easily reach temperatures below the dew point of a ventilated crawl space.

Use a 10 mil vapor barrier on the ground surface to prevent moisture migration from the ground. Cover the vapor barrier with gravel.

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G-8 SYSTEM SELECTION / SPACE HUMIDITY CONSIDERATIONS:

Direct humidity control using reheat is rarely necessary except in the most demanding climate control situations such as libraries or museums. Indirect humidity control can reasonably be achieved through thoughtful system design.

The paragraphs below are not meant to dictate equipment or system types. Rather, the goal is to point out the advantages and disadvantages of various systems with regard to space humidity for designer consideration.

Most systems are designed to do a good job of limiting humidity at full cooling load. The problem with high space humidity usually occurs at part load.

Oversized equipment essentially runs at part load all the time, so oversizing must be avoided.

Make sure the occupants needs for temperature and humidity are known.

Design systems to limit space relative humidity to 45% instead of the usual 50% at full load. Use an indoor design condition of 78 degF / 45% RH.

Design systems to limit space relative humidity to 60% at part load conditions.

Size cooling coils handling outdoor air for the design dry bulb temperature day, or the design humidity day which ever gives the greater coil capacity.

Single Zone Systems:

These systems modulate the supply air temperature in response to the space temperature.

Avoid adding safety factor to the cooling loads. Doing so increases the supply airflow, and with excess airflow comes high supply air temperature which leads to high space humidity.

A typical single zone air handling system serving a small office area is an example. Assess the cooling loads carefully and do not arbitrarily increase airflow or oversize the equipment.

Simple single zone systems serving a theater, an auditorium, or a gymnasium can be a problem, particularly if one air handler is used for the entire area. The wide fluctuation in load caused by the wide variation in the occupancy of these facilities leads to problems at part load conditions. In many cases, a single air handling unit sized for full occupancy can maintain space temperature setpoint with a supply air temperature that is within a degree or two of the space temperature when the facility is at a minimal occupancy. This insures part load humidity problems.

Get the airflow right and full load humidity problems are less likely. Always consider what will happen to the supply air temperature and the resulting space humidity at part load conditions. Consider the following possible solutions to part load humidity problems when using single zone equipment:

Colder Supply Air – Design for colder supply air. Then at part load the air will be colder than it would otherwise be, more moisture will be removed from the air stream, space humidity at part load will be lower. (Designing for lower space relative humidity will require colder supply air.)

Variable Air Volume Single Zone System – The single zone cooling coil provides constant discharge air temperature while the fan speed is modulated based on space temperature. After the fan reaches minimum speed the supply air temperature is modulated by decreasing.

Return Air Bypass Single Zone System – Using face and bypass dampers, bypass return air (not mixed air) around the cooling coil as the space cooling load is satisfied while the cooling coil operates with full flow.

Multiple Single Zone Systems – Use more than one air handling system. As the cooling load falls shut down one or more units. This causes the remaining units to supply colder air to maintain the space temperature setpoint.

Multizone Systems:

As with single zone, accurate determination of the cooling loads and zone airflow leads to good humidity control at full load conditions.

During warm weather, many multizone systems are operated without heating water to the heating coil because the boiler is turned off. Then at part load, mixed air is essentially bypassed around the cooling coil through the hot deck. The moisture laden mixed air is then delivered to the space causing a rise in the space humidity.

Improved part load performance space humidity performance can be achieved by resetting the hot deck temperature upward during periods of high humidity. (Of course this requires operating the boiler during the warm weather months.)

A Texas multizone with individual heating coils in the individual zone ducts also offers a possible solution to the part load humidity problem by providing a means of reheat.

Carefully consider the part load space humidity before using a multizone system.

Dual Duct Systems:

These systems typically have a hot and a cold deck and are similar to multizone systems. Instead of zone dampers, modulating dual duct mixing boxes mounted near the space combine the hot and cold air streams from separate ducts then deliver the mixture to the space. The part load humidity problems are the same as with a multizone.

Improved part load space humidity performance can be achieved by resetting the hot deck temperature upward during periods of high humidity. Of course this requires operating the boiler during the warm weather months.

A modified arrangement known as a Dew Point Dual Duct system could be employed for good humidity control. All of the mixed air in the air handler passes through the cooling coil. Then a portion of this air is split off and passes through the hot coil then to the hot duct. Both hot and cold air streams have the same low dew point temperature giving this arrangement its name.

Carefully consider the part load space humidity before using a dual duct system. The system may be more expensive than other alternatives due to the requirement for two supply main ducts. As with a variable air volume system, terminal boxes are required, and these create additional maintenance.

Variable Air Volume Systems:

Because a VAV air handler maintains cold discharge air, it automatically maintains reasonable space humidity and should be considered where applicable and when budget permits.

However, VAV systems are not a panacea. The valve, heating coil, controls, and often filter and fan inside every VAV box represent additional maintenance. The maintenance aggravation is amplified when the VAV boxes are not easily accessible.

Computer Room Units:

Oversized computer room units are common. Determining the cooling load by summing all the nameplate amp ratings of all the computer equipment will surely result in an oversized unit and cause inefficient operation. Space humidity may not be a problem only because the computer room unit has reheat capability. The unit adds enough heat to make up for the excess in airflow. Size computer room units to accommodate the estimated heat release from the computer equipment; airflows will be decreased, the supply temperatures will be lower for a longer period of time, and the reheat will operate far less frequently. Always consider multiple computer room units to split the cooling load.

Fan Coil Systems:

Fan coils usually handle sensible loads but often fall short on the latent load.

Do not design fan coil units to handle outdoor air because the cooling coils are usually not deep enough, because cycling the coil flow insures periods when no moisture removal occurs, and because local exhaust systems can cause bypass of outdoor air around the cooling coil directly into the space.

In lieu of specifying the total coil load for fan coil units, specify the entering and leaving air conditions, and specify that these conditions must be met at all fan speeds. Where multi-speed fan coil units are used, schedule the maximum airflow at the high fan speed setting.

Fan coil units represent a great maintenance burden. The multiple cooling coils with multiple filters, multiple condensate pans, multiple potential leak sources, and multiple potential locations for mold growth must be considered.

Fan coils shall be installed in a manner that will prevent water from dripping or splashing outside the drain pans. Require back splash panels to contain the splashing cause by drips from coil valves and uninsulated piping within the cabinet enclosure.

Direct Expansion (DX) Equipment

Avoid the use of DX coils in air handlers with constant running fans that handle outdoor air. When the sensible load is satisfied and the compressor turns off, unconditioned outdoor air is then delivered to the space and any water on the wet

cooling coil is evaporated into the supply air and also delivered to the space. The result is poor part load humidity control.

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G-9 CONDENSATE LEAKS:

Condensate drain pans and drain lines from air conditioning equipment must be designed to allow access for cleaning and flushing. Blockages in fan coil condensate lines are notorious for causing overflowing drain pans and wet floors, walls, and ceilings.

Improper trapping of condensate discharge in air handling units leads to water hold-up and overflow at the condensate drain pan.

Provide details of the condensate traps on the design drawings. Require adequate slope in two directions on condensate drain pans and drain lines (1/4 inch per foot). Make certain that the equipment curb or equipment frame affords ample elevation of the pan outlet connection above the floor or roof to accommodate the required trap dimensions and drain line slope.

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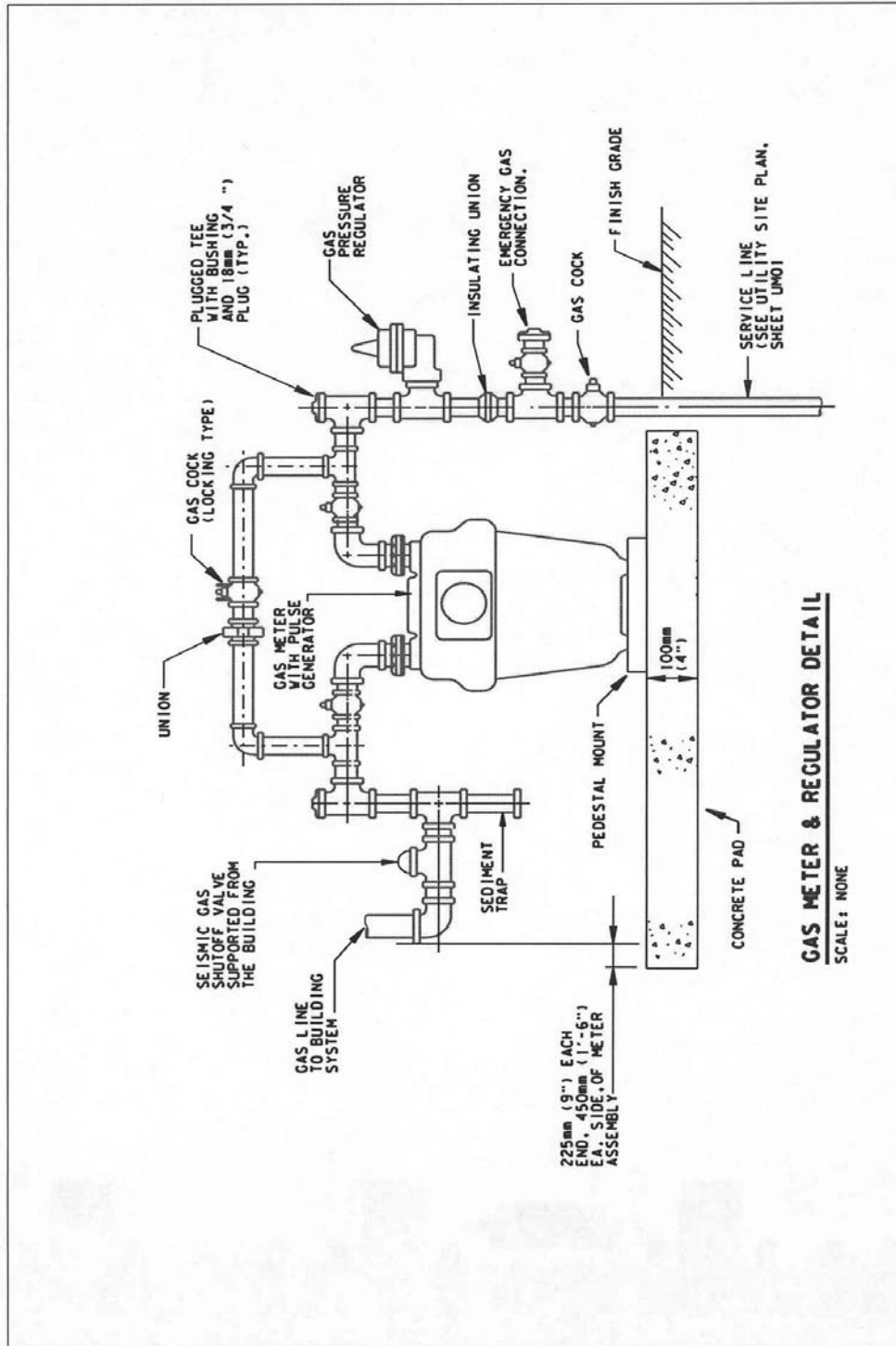
G-10 BARRACKS:

Barracks have historically had high humidity problems leading to mold growth in the living space.

In barracks, follow the technical design guidance found in TI 800-01 Appendix B Unaccompanied Personnel Housing for the mechanical systems in barracks. This guidance requires that outside air be treated (heated / cooled) by a separate dedicated air handling unit to a neutral temperature, or as necessary to handle the latent load, and ducted to each living / sleeping room.

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Gas Meter Detail



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APPENDIX I

Erosion and Sedimentation Control

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EXECUTIVE SUMMARY

This plan provides information on erosion control for activities that result from opening, operating, and closing all present and planned borrow pits on the Fort Campbell Military Reservation. This material is intended for use at Fort Campbell, KY by its military units and all authorized subcontractors. It provides step-by-step procedures to help plan, design, and install soil and water Best Management Practices (BMP). It does not override any local, city, county, state, or federal rule, regulation, or law, including job safety and utility safety laws. Where there is a difference between this plan and any language contained in any contractual document, the contractual document must be followed.

The standards and specifications listed in this manual provide criteria for the design, installation, and maintenance of water management and sediment control practices to abate nonpoint source (NPS) Pollution. Those responsible for design of these practices should evaluate the conditions existing on a particular site and determine if the minimum criteria contained in these standards are adequate or if more stringent criteria should be used.

Properly applied, this information will provide an efficient plan to operate the borrow pit site(s) while ensuring maximum safety and minimizing adverse impact to the environment. By following these guidelines, it is the intent of this management tool to furnish a uniform plan that will provide continuity throughout the life of the borrow p

CHAPTER 1—INTRODUCTION

General

It is the intent of this manual to help authorized borrow pit operators understand soil and water management practices. These Best Management Practices (BMP) recommendations are somewhat generalized because of wide variations in topography, geology, soils and plant requirements. Feasible ways to handle water management and to minimize erosion and sedimentation at the site are complex and vary according to each borrow pit location.

These guidelines will address borrow pit operations from site identification through final reclamation. The site manager as well as engineers and contractors must be fully cognizant of the environmental impact and strive to lessen the effect throughout the life of the project. This will also ensure minimal cost at the time of site closure.

Site Selection

After establishing a need for borrow or topsoil, suitable borrow areas should be examined. A site should be reasonably close to construction areas, yet remote enough not to hinder future development. Access to the site should not create any undue safety problems. The site should be of sufficient size to provide safe operations and years of acceptable material. No previously used impact areas will be considered, due to the threat of unexploded ordnance.

The topography of the area should allow for excavation throughout the construction season. Wetlands should be avoided, since altering or affecting them is subject to state or federal regulatory oversight and may require mitigation.

The material at the site must be acceptable to provide the fill requirements for projected construction. The initial determinations can be made with the use of soil surveys and the cooperation of the local county U.S. Natural Resource Conservation Service (NRCS). When fill materials appear to be acceptable, core drilling should be done to verify soil profiles. Laboratory testing is necessary to determine the natural moisture content, Atterberg limits, and compaction information.

Site Development

Safety and environmental considerations are paramount in site development. All roads should be designed to ensure smooth traffic flow and they should have ample traffic width as well as full shoulders. Grades into and out of the pit area will not exceed safe slope percent of grade or length of slope. Main access roads will require a construction that will allow trafficability in most weather conditions. During dusty conditions, provisions will be made for dust control.

It is necessary to protect the environment throughout the life of the site and restore vegetation as soon as possible after material excavation. Off-site sediment migration must be kept to a minimum. The best way to protect from off-

site sediment migration is to protect exposed soil and use sediment and runoff control measures.

The best way to minimize exposed soil is to prevent the pit operations from becoming larger than required for safe and efficient operations. As soon as the excavation of an area is complete, that portion shall be reclaimed and stabilized. If the active excavation area is kept below ten (10) acres then costly control measures such as sedimentation basins do not have to be designed, built, and maintained. However, it is not practical to mulch any of the active areas where borrow still remains because this would hamper fill compaction at the construction site.

Table 1. Fort Campbell Borrow Pit Locations

Pit Number	Grid Location	Status	Max Planned Size (Acres)	State
1	3960	Open	15	KY
2	4154	Open	5	TN
3	4653	Proposed	15	TN
4	5155	Open	45	KY
5	5154	Proposed	45	TN
6	5351	Proposed	20	TN
7	5145	Open	10	TN

Sediment control measures will be constructed to prevent off-site sedimentation. The design size of these structures will be of sufficient size to prevent exposed soil from being transported off-site. Periodic maintenance and evaluation of these controls will be required.

A system of runoff control measures should be used to direct water away from the active borrow area. By diverting surface water from the active pit area, work may continue during rainy periods. These diversions can be constructed when removing vegetation and/or topsoil.

Site Operations

To maintain the continuity of the operation, the Conservation Branch of the Directorate of Public Works, Natural Resources (DPW) will oversee the operation of the borrow pit. This is imperative considering the number of contractors and users operating in the pit, coupled with the longevity of the site.

Prior to any borrow excavation, sediment control measures should be designed and constructed. Runoff control measures necessary to ensure that water passes through the basin should also be constructed. An adequate network of roads should be designed and constructed, keeping in mind that they will be used for the life of the borrow area. One-way roads are preferable for safety and ease of operations.

The pit will be opened at its lowest elevation to ensure positive drainage control. Any marketable timber should be harvested. All forest debris, brush and shrubs must be piled and disposed of in accordance with the procedures described in Chapter 2. Topsoil should be stripped and stockpiled. If there is no pending requirement for topsoil, the topsoil stockpile will be protected from erosion by seeding and mulch. The area of topsoil removal should expose enough borrow material for the projected year's construction. Borrow in the pit must be excavated to a controlled elevation. Reclamation design contours must maximize borrow removal while maintaining positive drainage.

As soon as practical after borrow removal, the area will be stabilized and revegetated. Reclamation should be close behind the pit operations and completed contemporaneously with borrow excavation. Topsoil replacement will expedite revegetation and cover acid forming subsoil. Prior to preparing the soil for seeding, soil tests should be taken and soil amendments applied according to recommendations. If no topsoil is replaced, then the acid forming potential of the subsoil should be considered in lime recommendations. The prepared area will be seeded with a mixture of legumes and warm season grasses. The seeded area will be mulched at the rate of three tons of straw or hay per acre. The mulch will be crimped (or otherwise stabilized) into the soil.

Responsibilities

SITE MANAGER. The site manager is Joseph D. Whitfill, Conservation Branch, 798-9850.. It is his responsibility of to ensure safe and continuous operations of the site. The site manager will direct the general operations of the contractors and other users operating in the pit area. The site manager will direct all maintenance of roads and control measures.

CONTRACTOR/USER. The contractor and other users will meet with the site manager prior to operating in the pit. It will be the responsibility of the contractor/user to maintain pit roads and adhere to safe operating procedure.

PROVOST MARSHALL. The Provost Marshall will periodically patrol the area to inspect for unauthorized use of the area.

Stormwater Permitting

Stormwater runoff from construction activities is one facet of water quality and quantity management that is being regulated on construction sites of a certain size through the U.S. Environmental Protection Agency (EPA). The stormwater permit program was enacted by Congress in 1987 in the amendment to The

Water Pollution Control Act. This program falls under the National Pollution Discharge Elimination System (NPDES).

The program presently applies only to those construction sites that will disturb five or more acres. The area of disturbance is defined as that portion of the site where ground cover and/or topsoil is removed, as contrasted with areas where tree or shrub clearing is the only activity.

Programs vary from state to state and appropriate state agencies should be consulted before borrow pit activities begin to determine applicability.

The Fort Campbell representative can be contacted at:

Directorate of Public Works
Compliance Branch
Storm Water Program Manager
(502) 798-9784

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CHAPTER 2–BORROW SITE PROCEDURES

Clearing and Grubbing

Description

This work is associated with the clearing, grubbing, removing and disposing of all vegetation and debris. This work shall also include the preservation from injury or defacement of all vegetation and objects designated to remain.

The work under this section shall also consist of removing and disposing of dead, diseased, poorly formed or other trees designated by the site manager to be undesirable and shall include removal and disposal of undergrowth, stumps of uprooted trees, logs, vines, other undesirable vegetation, and all debris designated by the site manager.

Specifications

a) General

1. The site manager will establish borrow pit boundary lines, construction lines and designate all trees, shrubs, plants and other items to remain. Any damage to natural terrain or to vegetation or objects designated to remain shall be repaired, replaced, or otherwise compensated for, as determined by the site manager, at the expense of the Contractor. All cut or scarred surfaces of trees or shrubs shall be treated with an asphaltum base paint especially prepared for tree surgery.
2. All marketable timber within the construction and easement limits which have not been removed prior to the beginning of borrow operations, along with other timber within the right of way designated by the site manager for removal, shall remain the property of the US Government, unless otherwise specified by the plans or proposal.

B) Clearing

1. The area within the construction lines shall be cleared of all surface objects and all trees, stumps, roots and other objectionable obstructions resting on or protruding through the surface of the original ground not designated to be retained.
2. Areas outside the borrow lines shall be selectively cleared of designated dead wood, undergrowth, rubbish and other objectionable matter, designated trees and stumps. This includes trimming and treatment of damaged trees (in accordance with good tree surgery practice). Natural ground cover shall be protected insofar as practical.

c) Grubbing

All areas within the construction lines shall be grubbed of all objectionable matter on or projecting through the ground surface. All fill areas shall be grubbed to a depth at least one foot below the natural ground.

d) Disposal of Materials

1. The Contractor shall submit prior to beginning work, a plan for the satisfactory disposal of material and debris from the clearing and grubbing operations for approval by the site manager.
2. The plan shall provide for the satisfactory disposal of perishable materials and rubbish within 30 days after accumulation, unless a longer period is authorized in writing by the site manager, to prevent infestation of pests. No material may be buried on the Fort Campbell installation.
3. Some acceptable methods of disposal may include:

a) BURNING

Burning of perishable materials will be permitted only when authorized by Directorate of Public Works (DPW) and Range Control, in accordance with applicable laws, and the following:

Any burning must be performed under the constant care of a competent watchman, at such times and in such a manner that will not jeopardize or cause damage or injury to surrounding vegetation, public or private property or anything designated to remain on the right of way.

b) LANDFILLING

All materials designated for landfill disposal may be deposited in the nearest permitted off-post landfill.

c) RECYCLING

The use of mechanical brush clippers or other recycling methods for vegetation will be considered for approval.

d) WINDROW

Biodegradable materials may be windrowed on site.

Topsoil Removal

Description

Topsoil is defined as a natural, workable, friable, loamy soil without a mixture of subsoil, refuse, or foreign materials, reasonably free from hard lumps, stiff clay, hardpan, gravel, noxious weeds, brush, or other undesirable material, and suitable for growing grasses, legumes, or other vegetative ground cover.

Acceptable topsoil shall be well drained and has a healthy vegetative growth, and does not contain toxic amounts of either acid, alkaline, or other phytotoxic

elements. The areas from which topsoil is secured shall possess such uniformity of soil depth, color, texture, drainage and other characteristics as to offer assurance that, when removed in quantity, the product will be homogeneous in nature and of acceptable quality.

Specifications

a) General

All areas from which topsoil is to be stripped shall be cleaned of all refuse which will hinder or prevent seedbed preparation or growth. When securing topsoil from approved areas, should unforeseen strata or seams of material occur which do not meet the requirements for topsoil, such material shall be removed from the topsoil and disposed of as directed or if directed, the area shall be abandoned.

b) Hauling Topsoil

Topsoil shall be hauled in vehicles suitable for the purpose. Scrapers of reasonable capacity will be considered as acceptable; however, excessive spillage will not be tolerated and loads shall be controlled to prevent such spillage. Topsoil spilled on subgrade or other base or pavement structure layers shall be removed immediately.

c) Maintenance

The topsoil that has been set aside shall be maintained through seeding, sodding, planting, or other work, until final completion of the project. Maintenance shall consist of preserving, protecting, and such other work as may be necessary to keep the work in a satisfactory condition.

d) Topsoil may only be placed in the borrow pit area with the approval of the site manager. All topsoil must be free of any foreign debris. No topsoil will be accepted which has large rock, asphalt, metal or other materials.

Access Roads

Description

Access road design and development shall consider the longevity of the borrow pit operation. Since the entire area is projected for borrow removal, a main access road will be constructed around the perimeter of the site. The road will be designed with drainage and a graveled treadway to serve as an all weather road.

Temporary pit roads from the main access road can be constructed with borrow material. At no time will any road prevent the active borrow site drainage from passing through the sediment basin.

Specifications

a) General

1. Temporary roads shall follow the contour of the natural terrain to the extent possible. Slopes should not exceed 10 percent.
2. Temporary parking areas should be located on naturally flat areas to minimize grading. Grades should be sufficient to provide drainage but should not exceed four (4) percent.
3. Roadbeds should be at least 14 feet wide for one-way traffic and 20 feet wide for two-way traffic.
4. Drainage ditches shall be provided as needed and shall be designed and constructed to carry anticipated storm flows.
5. The roadbed or parking surface shall be cleared of all vegetation, roots and other objectionable material.
6. A 6-inch course of clean aggregate shall be applied immediately after grading. Filter fabric may be applied to the roadbed for additional stability in accordance with fabric manufacturer's specifications.

b) Construction Entrance

1. A gravel construction entrance is a pad of crushed stone that reduces the tracking of mud onto the adjacent road. To construct the pad, place a layer of 2- to 3-inch stone across the full width of the vehicle ingress and egress area. The stone pad should be at least 50 feet long and at least 6 inches thick. Additional stone may have to be added periodically to maintain the proper functioning of the pad.
2. There will be no washing of wheels in the borrow site.

c) Maintenance

Both temporary and permanent roads and parking area may require periodic top dressing with new gravel. Seeded areas adjacent to the roads and parking areas should be checked periodically to insure that a vigorous stand of vegetation is maintained. Roadside ditches and other drainage structures should be checked regularly to ensure that they do not become clogged with silt or other debris. The paved roads in the area will be inspected daily by the contractor/user and all mud/dirt deposits removed. The site manager along with authorized contractors shall maintain all access and pit roads.

Dust and Pollutant Control

Description

Dust and pollutant control measures are implemented to reduce surface and air movement of dust and other pollutants during land disturbing, demolition, and other construction activities. The purpose of these controls is to prevent surface and groundwater contamination and air transport of dust and other pollutants from exposed surfaces and to reduce the presence of airborne substances that may be harmful or injurious to human health, welfare, and safety, or to animals and plant life. This practice is applicable to heavy use areas on the borrow site and to areas subject to surface and air movement of dust where, without treatment, on-site and off-site damage may occur.

Earth moving activities cause the largest amount of construction dust emissions. The less soil exposed at one time, the less potential there is for dust generation. Therefore, dust control should involve phasing of borrow pit activities and utilizing temporary stabilization measures upon completion of grading.

Oil, gasoline, grease, solvents and other pollutants are associated with equipment used on construction sites. The level of equipment maintenance and repair will, of course, depend upon the size and complexity of the project. Whenever equipment must be serviced, special precautions should be taken.

Specifications

a) General

Blowing dust may be controlled permanently or temporarily, depending on the needs of the site. The following summarizes available temporary dust control methods:

b) Temporary Practices

- Mulching: Chemical mulch binders may be used instead of asphalt to bind mulch materials. Binders such as Curasol or Tenatack should be used according to manufacturer's recommendations.
- Vegetative Cover: Refer to Temporary Seeding measures in Chapter 3.
- Spray-on-Adhesives: These are used on mineral soils (not effective on muck soils); traffic should be kept off the area. Apply under proper weather conditions according to manufacturer's directions.
- Wetting: Water can be sprayed by truck or by hand, along the access roads and in the work area to hold down the dust.

c) Permanent Practices

- Permanent Vegetation: Existing trees and large shrubs may afford valuable protection if left in place. Also refer to Permanent Seeding section of this manual (see Chapter 4, B).

- Top soil: This entails covering the surface with less erosive soil material. Refer to section in this manual on Topsoil (see Chapter 4, A).
- Stone: Cover surface with crushed stone or coarse gravel.

Maintenance and repair of equipment should be confined to areas specifically designed for that purpose. These areas should have adequate waste disposal receptacles for liquid as well as solid waste. Take waste oil to designated waste oil collection areas for recycling. On sites where designed areas for equipment servicing is not feasible, special care should be taken to assure that potential pollutants cannot be washed into nearby receiving streams.

Adequate sanitary facilities, such as chemical toilets, should be placed near maintenance areas or other convenient sites on the construction area.

Scrap from maintenance and other construction litter should be placed in containers or otherwise disposed of properly.

Maintenance areas should be inspected and cleaned daily.

Oil and Grease

To eliminate the potential of large spills, no fuel tanks are permitted at the site. Refueling and lubrication of equipment can only be performed at the site by a portable fueling/servicing truck. Unserviceable equipment must be evacuated from the site for repairs.

Spoil from Construction Sites

Spoil from construction sites on Fort Campbell will be accept into the open borrow pit or closed pit located on On the Line Road. Spoil must be separated as to topsoil or subsoil. It will contain no asphalt or large rocks, metal or other construction debris. All soil will be placed at a site designated by the site manager, deposited in lifts, capped and temporarily seeded. It is the contractor's responsibility to ensure compliance with this requirement.

Permit to use Borrow Pits.

Any contractor wishing to either excavate soil or dispose of spoil must obtain a permit from the site manager prior to operations. The permit must be maintained by all trucks and equipment operating within the borrow pit. Failure to keep proper documentation within the vehicles could result in fines imposed for improper access and dumping. The contractor must provide at a minimum the contract number, quantity of soil to be moved, type of soil, and the dates of operation. The form is located at App C.

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CHAPTER 3—EROSION AND SEDIMENTATION CONTROL

Sediment Control Measures

Sedimentation Basin

Description

A sedimentation basin is a temporary barrier or dam constructed across a watercourse or at other suitable locations to retain sediment and other waterborne debris. They are required by the EPA

Temporary sediment basins are used as a means of trapping and storing sediment from eroding areas in order to protect downstream areas from damage resulting from sedimentation and waterborne debris.

Sedimentation basins should be used at sites where:

1. Failure of the structure would not result in loss of life; damage to homes; commercial, or industrial buildings; damage to highways or railroads, or interruption of use or service or private utilities.
2. The height of dam is 25 feet or less, as measured from the natural streambed at the downstream toe of dam to the top of dam.
3. The product of the total volume of storage (acre-feet) and the height of dam (feet) is not greater than 3,000.
4. The drainage area is 100 acres or less.
5. The basin will be removed within a three-year period after construction.

Temporary sediment basins apply where physical site conditions or other restrictions preclude the installation of erosion control measures to adequately control erosion and sedimentation. It may be used downslope from borrow operations that expose areas to erosion. Temporary sediment basins will be removed after the exposed areas are adequately protected against erosion by vegetative or mechanical means.

Regulation

Unless otherwise excepted, all dams with a height of 25 feet or more, or storage of 50 acre-feet or more, require detailed construction plans prior to the start of construction. The height of the dam is measured from the natural streambed at the downstream toe of dam to the top of dam.

Design and construction shall comply with all federal, state and local laws, ordinances, rules and regulations.

Planning Considerations

Sediment basins are typically only 70-80 percent effective in trapping sediment that flows into them. Therefore, they should be used in conjunction with erosion control practices such as temporary seeding, mulching, diversion dikes, etc., to reduce the amount of sediment flowing into the basin.

To improve the effectiveness of the basin, it should be located so as to intercept the largest possible amount of runoff from the disturbed area. The best locations are generally low areas and natural drainage ways below disturbed areas. Drainage into the basin can be improved by the use of stabilized diversion dikes and ditches. The basin must not be located in a live stream but should be located to trap sediment-laden runoff before it enters the stream. The basin should not be located where its failure would result in the loss of life or interruption of the use or service of public utilities or roads.

Sediment basins may be designed as permanent structures to remain in place after construction is completed. Site conditions may make the use of these structures desirable for stormwater detention purposes. Wherever these structures are to become permanent, or if they exceed the size limitations of the design criteria, they must be approved by the DPW and designed as permanent ponds by a qualified Professional Engineer.

Specifications

(a) Embankment Basin

1. The foundation area shall be cleared of all trees, stumps, roots, and brush boulders, sod, and debris. All channel banks and sharp breaks shall be sloped to no steeper than 1:1. All topsoil containing excessive amounts of organic matter shall be removed. The surface of the foundation area will be thoroughly scarified before placement of the embankment material.
2. The cutoff trench shall be excavated to the lines and grades shown on the plans or as changed during construction because of site conditions, and shall be backfilled with suitable material in the same manner as specified for earth embankment. The trench shall be kept free of standing water during backfill operations.
3. Existing stream channels crossing the foundation area shall be sloped no steeper than 1:1 and deepened and widened as necessary to remove all stones, gravel, sand, roots, and other objectionable material and to accommodate compacting equipment. Such channels shall then be backfilled with suitable material as specified for each embankment.
4. The pipe conduit barrel shall be placed on a firm foundation to the lines and grades shown on the plans. Selected backfill material shall be placed around the conduit in layers, and each layer shall be compacted to at least the same

density as the adjacent embankment. All compaction within 2 feet of the pipe spillway will be accomplished with hand-operated tamping equipment.

5. The material placed in the fill shall be free of all sod, roots, frozen soil, stones more than 6 inches in diameter, and other objectionable material. The placing and spreading of the fill material shall be brought up in approximately 6-inch horizontal layers or of such thickness that the required compaction can be obtained with the equipment used. Construction equipment shall be operated over the area of each layer in a way that will result in the required compaction.
6. Special equipment shall be used when the required compaction cannot be obtained without it.
7. The distribution and gradation of materials throughout the fill shall be such that there will be no lenses, pockets, streaks, or layers of material differing substantially in texture or gradation from the surrounding material. Where it is necessary to use materials of varying texture and gradation, the more impervious material shall be placed in the upstream and center portions of the fill.
8. The moisture content of fill material shall be such that the required degree of compaction can be obtained with the equipment used.
9. Fill shall not be placed on frozen, slick or saturated soil.

The topsoil material saved in the site preparation shall be placed as a top dressing on the surface of the emergency spillways, embankments, and borrow areas. It shall be evenly spread to a thickness as specified on the plans.

A protective cover of herbaceous vegetation shall be established on all exposed surfaces of the embankment and spillway to the extent practical under prevailing soil and climatic conditions.

Excavated Basins

The completed excavation shall conform to the lines, grades and elevation shown on the plans.

The material excavated from the basin shall be placed in one of the following ways so that its weight will not endanger the stability of the side slopes and where it will not be washed back into the basin by rainfall:

1. Uniformly spread to a height not exceeding 3 feet with the top graded to a continuous slope away from the basins.
2. Uniformly place or shape with side slopes assuming the natural angle of repose for the excavated material behind a berm width equal to the depth of the basin, but not less than 12 feet.

Straw Bale Barrier

Description

A straw bale barrier is a temporary barrier to trap sediment consisting of a row of entrenched and anchored straw bales. The purpose of the structure is:

1. To intercept and detain small amounts of sediment from disturbed areas in order to prevent sediment from leaving the site.
2. To decrease the velocity of sheet flows and low-to-moderate level channel flows.

Straw bale barriers should be used under the following conditions:

1. Below disturbed areas subject to sheet and rill erosion and
2. Where the size of the drainage area is no greater than 1/4 acre per 100 feet of barrier length; the maximum slope length behind the barrier is 100 feet; and the maximum slope gradient behind the barrier is 50 percent (2:1) and
3. In minor swales or ditch lines where the maximum contributing drainage area is no greater than 2 acres and
4. Where erosion control is required for less than 3 months and
5. Under no circumstances should straw bale barriers be constructed in live streams or in swales where there is the possibility of a washout.

Planning Considerations

1. Straw bale barriers that are used in streams and drainage ways with high water velocities and volumes will be destroyed or have diminished effectiveness.
2. Improper placement and installation of the barriers, such as staking the bales directly to the ground with no soil seal or entrenchment, will allow undercutting and end flow. This will result in additions of, rather than removal of, sediment from runoff waters. Inadequate maintenance lowers the effectiveness of these barriers. Trapping efficiencies of carefully installed straw bale barriers can drop from 57 percent to 16 percent in one month due to lack of maintenance.

Specifications

a) Sheet Flow Applications

1. Bales shall be placed in a single row, lengthwise on the contour, with both ends of adjacent bales tightly abutting one another.

2. All bales shall be either wire-bound or string-tied. Straw bales shall be installed so that bindings are oriented around the sides rather than along the tops and bottoms of the bales (in order to prevent deterioration of the bindings).
3. The barrier shall be entrenched and backfilled. A trench shall be excavated the width of a bale and the length of the proposed barrier to a minimum depth of 4 inches. After the bales are staked and chinked, the excavated soil shall be backfilled against the barrier. Backfill soil shall conform to the ground level on the downhill side and shall be built up to 4 inches against the uphill side of the barrier.
4. Each bale shall be securely anchored by at least two stakes or rebars driven through the bale. The first stake in each bale shall be driven toward the previously laid bale to force the bales together. Stakes or rebars shall be driven deep enough into the ground to securely anchor the bales.
5. The gaps between bales shall be chinked (filled by wedging) with straw to prevent water from escaping between the bales. (Loose straw scattered over the area immediately uphill around a straw bale barrier tends to increase barrier efficiency.)
6. Inspection shall be frequent, and repair or replacement shall be made promptly as needed.
7. Straw bale barriers shall be removed when they have served their usefulness, but not before the upslope areas have been permanently stabilized.

b) Channel Flow Applications

1. Bales shall be placed in a single row, lengthwise, oriented perpendicular to the contour, with ends of adjacent bales tightly abutting one another.
2. The remaining steps for installing a straw bale barrier for sheet flow applications apply here, with the following addition:
3. The barrier shall be extended to such a length that the bottoms of the end bales are higher in elevation than the top of the lowest middle bale to assure that sediment laden runoff will flow either through or over the barrier, but not around it.

Maintenance

1. Straw bale barriers shall be inspected immediately after each rainfall and at least daily during prolonged rainfall.
2. Close attention shall be paid to the repair of damaged bales, end runs and undercutting beneath bales.
3. Necessary repairs to barriers to replace bales shall be accomplished promptly.

4. Sediment deposits should be removed after each rainfall. They must be removed when the level of deposition reaches approximately one-half the height of the barrier.
5. Any sediment deposit remaining in place after the straw bale barrier is no longer required shall be dressed to conform to the existing grade, prepared and seeded.

Silt Fence

Description

A silt fence is a temporary barrier to trap sediment that consists of a filter fabric stretched between supporting posts, with the bottom entrenched in the soil. The Silt Fence is a temporary linear filter barrier constructed of synthetic filter fabric, posts, and, depending upon the strength of the fabric used, wire fence for support. The purpose of a silt fence is to intercept and detain small amounts of sediment from disturbed areas during construction operations in order to prevent sediment from leaving the site and damaging streams or entering sinkholes.

Silt fences should be used under the following conditions:

1. Below disturbed areas where erosion would occur in the form of sheet and rill erosion and
2. Where the size of the drainage area is no more than 1/4 acre per 100 feet of silt fence length; the maximum slope length behind the barrier is 100 feet; and the maximum gradient behind the barrier is 50 percent (2:1) and
3. In minor swales or ditch lines where the maximum contributing drainage area is no greater than 2 acres and
4. Under no circumstances should silt fences be constructed in live streams or in swales or ditch lines where flows are likely to exceed 1 cubic foot per second (cfs).

Specifications

a) General

1. Synthetic filter fabric shall be a pervious sheet of propylene, nylon, polyester or ethylene yarn and shall be certified by the manufacturer or supplier.
2. Burlap shall be 10-ounce per square yard fabric.
3. Posts for Silt Fences shall be either 2-inch diameter wood or 1.33 pounds per linear foot steel with a minimum length of 5 feet. Steel posts shall have projections for fastening wire to them. They should be installed 10 feet on center.

4. Wire fence reinforcement for silt fences using standard strength filter cloth shall be a minimum of 42 inches in height, a minimum of 14 gauge and shall have a maximum mesh spacing of 6 inches.
5. A trench shall be excavated approximately 4 inches wide and 4 inches deep along the line of stake and upslope from the barrier.
6. The filter material shall be attached to the stakes, and 8 inches of fabric shall be extended into the trench. Filter material shall not be stapled to existing trees.
7. The trench shall be backfilled and the soil compacted over the filter material.

Maintenance

1. Silt fences shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. Any required repairs shall be made immediately.
2. Should the fabric on a silt fence decompose or become ineffective prior to the end of the expected usable life and the barrier is still necessary, the fabric shall be replaced promptly.
3. Sediment deposits should be removed after each storm event. They must be removed when deposits reach approximately one-half the height of the barrier.
4. Any sediment deposit remaining in place after the silt fence is no longer required shall be dressed to conform with the existing grade, prepared and seeded.

Runoff Control Measures

Diversion

Description

A diversion is a channel constructed across a slope with a supporting ridge on the lower side. The purpose of the structure is to reduce slope length and to intercept and divert stormwater runoff to stabilized outlets at non-erosive velocities.

Diversions should be used under the following conditions:

1. Where runoff from higher areas may damage property, cause erosion, or interfere with the establishment of vegetation on lower areas.
2. Where the slope length needs to be reduced to minimize soil loss.

Planning Considerations

Diversions can be useful tools for managing surface water flows and preventing soil erosion. On moderately sloping areas, they may be placed at intervals to

trap and divert sheet flow before it has a chance to concentrate and cause rill and gully erosion. They may be placed at the top of cut or fill slopes to keep runoff from upland drainage areas off the slope. They can also be used to protect structures, parking lots, adjacent properties, and other special areas from flooding.

Diversions are preferable to other types of man-made stormwater conveyance systems because they more closely simulate natural flow patterns and characteristics. Flow velocities are generally kept to a minimum. When properly coordinated into the landscape design of a site, diversions can be visually pleasing as well as functional.

As with any earthen structure, it is very important to establish adequate vegetation as soon as possible after installation. It is equally important to stabilize the drainage area above the diversion so that sediment will not enter and accumulate in the diversion channel.

A diversion channel must have a minimum capacity to carry the runoff expected from a 10-year frequency storm with a freeboard of at least 0.3 foot.

Specifications

1. All dead furrows, ditches or other depressions to be crossed shall be filled before construction begins or as part of construction, and the earthfill used to fill the depressions will be compacted using the treads of the construction equipment. All old terraces, fence rows, or other obstructions that will interfere with the successful operation of the diversion will be removed.
2. The base for the diversion ridge is to be prepared so that a good bond is obtained between the original ground and the place filled. Vegetation is to be removed and the base thoroughly disked prior to placement of fill.
3. The earth materials used to construct the earth fill portions of the diversions shall be obtained from the diversion channel or other approved source.
4. The earthfill materials used to construct diversions shall be compacted by routing the construction equipment over the fill in such a manner that the entire surface of the fill will be traversed by not less than one tread track of the equipment.
5. The completed diversion shall conform to the cross section and grade shown on the design.
6. Fertilizing, seeding, and mulching shall conform to the recommendations in the applicable vegetative standard and specification.
7. If there is no sediment protection provided on temporary diversion, it should be anticipated that periodic cleanout may be required.

8. Construction operations shall be carried out in such a manner that erosion and air and water pollution will be minimized. State and local laws concerning pollution abatement shall be followed.

Maintenance

Before final stabilization, the diversion should be inspected after every rainfall. Sediment shall be removed from the ditchline and repairs made as necessary. Seeded areas that fail to establish a vegetative cover shall be reseeded as necessary.

Waterway

Description

A waterway is a natural or constructed waterway or outlet shaped or graded and established in suitable vegetation as needed for safe disposal of runoff water. The purpose of a waterway is to provide for the disposal of excess surface water from construction sites without causing erosion.

Supplemental measures may be required with this practice. These may include such things as (1) grade control structures, (2) subsurface drainage to permit growing suitable vegetation and to eliminate wet spots that may be a nuisance, (3) a paved channel bottom or buried storm drain to handle storm runoff, base flow or snowmelt.

The location of waterway channels is of considerable importance to a good program of erosion and sedimentation control. Wherever possible, the site manager should preserve the natural drainage system. Waterways should generally be located in natural drainageways where water can drain in from all sides. When the establishment of vegetation is required, moisture conditions and soil fertility are usually best in such areas. Waterway channels should be located so that they do not make sharp, unnatural changes in direction of flow.

All waterway channels should have stable outlets with adequate capacity for the designed flow. The outlet may be another vegetated channel, an earth ditch, a structure, or other suitable outlet. In all cases, the outlet must discharge in such a manner as not to cause erosion. Outlets should be constructed and stabilized prior to the operation of the waterway channel. Applicable drainage laws, traditional case law precedent and local ordinances and regulations must be observed in locating waterway channels and outlets.

Specifications

1. All trees, brush, stumps, and other objectionable material shall be removed and disposed of in a manner so that they will not interfere with construction or the proper functioning of the waterway or outlet.

2. The waterway or outlet shall be constructed to the dimensions specified on the design, and the cross section shall be free from bank projections or other irregularities.
3. All ditches or other depressions below the designed grade will be back filled with fill material that is free from brush, roots, sod or other perishable material, and rocks in excess of 6 inches in diameter. Backfill will be placed in approximately uniform horizontal layers of not more than 9 inches in thickness and each layer will be compacted using the treads or tracks of the construction equipment.
4. After the waterway has been constructed to proper grades and cross section with proper allowance for topsoil, the topsoil will be uniformly spread over the area to a minimum depth of 4 inches.
5. Waterways or outlets shall be protected against erosion by vegetative means as soon after construction as practical and before diversions or other channels are released into them. Consideration should be given to sodding channels to provide erosion protection immediately after construction.

Soil Stabilization Measures

The following soil stabilization techniques should be implemented if borrow pit sections are not closed as soon as excavation is complete.

Temporary seeding

Description

Temporary seeding is used to establish a temporary vegetative cover on disturbed areas by seeding with appropriate rapidly growing annual plants. The purpose of temporary seeding is to reduce erosion and sedimentation by stabilizing disturbed areas that will not be brought to final grade for a year or less and to reduce problems associated with mud and dust production from bare soil surfaces during construction.

Temporary seeding is necessary where exposed soil surfaces are not to be fine-graded for periods from 30 days to one year. Such areas include denuded areas, soil stockpiles, sides of sediment basins, temporary roadbanks, etc.

Planning Considerations

Sheet erosion, caused by the impact of rain on bare soil, is the source of most fine particles in sediment. To reduce this sediment load in runoff, the soil surface itself should be protected. The most efficient and economical means of controlling sheet and rill erosion is to establish vegetative cover. Annual plants that sprout rapidly and survive for only one growing season are suitable for establishing temporary vegetative cover.

Temporary seeding may prevent costly maintenance operations on other erosion control systems. For example, sediment basin clean-outs will be reduced if the drainage area of the basin is seeded where excavation is not taking place.

Temporary seeding is essential to preserve the integrity of earthen structures used to control sediment, such as diversions, and the banks and dams of sediment basins.

Specifications

a) General

Prior to seeding, install necessary erosion control practices such as waterways and basins.

b) Plant Selection

Select plants appropriate to the season and site conditions. The local Natural Resource Conservation Service may supply more specific information upon request.

c) Seedbed Preparation

To control erosion on bare soil surfaces, plants must be able to germinate and grow. Seedbed preparation is essential. The following must be considered prior to seeding:

1. Liming: Where soils are known to be highly acidic (pH 5.5 and lower), lime should be applied at the rate of two tons of pulverized agricultural limestone per acre, or in accordance with local extension office recommendations.
2. Fertilizer: Shall be applied as 500 pounds/acre of 6-12-12 (10 pounds/1,000 ft²) or equivalent. Lime and fertilizer shall be incorporated into the top 2 to 4 inches of the soil.
3. Surface Roughening: If the area has been recently loosened or disturbed, no further roughening is required. When the area is compacted, crusted, or hardened, the soil surface shall be loosened by discing, raking, harrowing, or other acceptable means.
4. Tracking: Tracking with bulldozer cleats is most effective on sandy soils. This practice often causes undue compaction of the soil surface, especially in clayey soils, and does not aid plant growth as effectively as other methods of surface roughening.

c) Seeding

Table 2. Guidelines for selecting vegetative cover

Plant or Plant Mixture	Application Rate per Acre	Plant Dates
Rye	3 bushels	Aug. 15 - Nov. 1
Wheat	2-3 bushels	Sept. 1 - Nov. 1
Annual Ryegrass	30 pounds	Aug. 15 - Nov. 1
Browntop or Pearl Millet	20 pounds	Apr. 1 - July 15
Fescue	10 pounds	Mar 1- May 30

Seed shall be evenly applied with a cyclone seeder, drill, cultipacker seeder or hydroseeder. Small grains shall be planted no more than one-inch deep. Grasses and legumes shall be planted no more than 1/4-inch deep.

d) Mulching

1. Seedings made in fall for winter cover shall be mulched.
2. At other times of the year, seedings made on slopes in excess of 4:1, or on adverse soil conditions, or during excessively hot or dry weather, shall be mulched.
3. Seedings made during optimum spring and summer seeding dates, with favorable soil and site conditions, will not require mulch.

Ground Cover

Description

Ground covers are plants that naturally grow very close together, causing severe competition for space, nutrients, and water. They are used to stabilize disturbed areas by establishing vegetative cover with trees, shrubs, or vines. The purpose of ground cover is to aid in stabilizing soil in areas where vegetation other than turf is preferred and provides food and shelter for wildlife where wildlife habitat is desirable.

Ground cover should be used under the following conditions:

1. On steep or rocky slopes, where mowing is not feasible.
2. In shady areas where turf maintenance is difficult.
3. Where woody plants are desirable for soil conservation and the establishment of wildlife habitat.

Planning Considerations

1. Protect the area from excess runoff as necessary with diversions, grass waterways or sediment basins.
2. Evaluate the capabilities and limitations of the soil to be planted. Special attention should be placed on soil pH, texture, internal water movement, steepness, and stability in order to plan the appropriate treatment.
3. The species and type of plant selected should be based on soil type, planned use of the area, and the amount of maintenance that can be devoted to the area in the future.
4. Fertilizer, lime, seedbed preparation, and irrigation should be used as necessary to promote quick establishment.
5. Plantings cannot be expected to provide erosion control and prevent soil slippage on a soil that is not stable due to its structure, water movement, or excessive slope.

Specifications

a) Planting Time:

Planting should be done in early spring if possible, but no later than May 1, for bare root stock. This allows for the maximum root and top development to reduce soil erosion and allow the plant to become established before winter.

(b) Soil Preparation

1. For short slopes, small areas, and mass plantings of close spacing apply a commercial granular fertilizer, such as 6-12-12, and organic supplement, such as composted cow manure, peat, or well-rotted sawdust, and work into the soil prior to planting. Fertilize with 500 pounds per acre. The organic material needed will depend upon the soil and plant being used. Plants such as pachysandras require a high rate of organic material, about a 2-inch layer worked into the root zone. Depending on the type and steepness of slope, the depth of soil preparation will vary from 4 to 6 inches.
2. For steep slopes and large area plantings, working up the entire planting area would be impractical and would probably induce erosion. Center hole planting, a hole dug for each plant, would be more desirable. If the soil on the slope is poorly suited to the species being planted, incorporate organic material into the slanting hole. Whether organic material is needed or not, fertilize each plant at the rate of one ounce per plant of a complete fertilizer such as 6-12-12. Mix fertilizer with soil below the roots of the plants or place a slow-release pellet or packet in bottom of planting hole.

c) Planting

1. Select the desired type and species of plants based on the suitability of the soil, the planned use, and the characteristics of the site.
2. Soil for ground covers should be well prepared. A well-drained soil high in organic matter is best. If the area to be planted is so large that adding amendments to the soil as a whole would be impractical, organic matter may be added only to each planting hole.
3. Plants such as ivy, pachysandra, and periwinkle should be planted on one-foot centers; large plants such as juniper can be spaced on three-foot centers.
4. The soil between trees and shrubs must be planted with cover vegetation or must be mulched. When establishing ground covers, it is not desirable to plant species that will make maintenance difficult. A thick durable mulch such as shredded bark or wood chips is recommended to prevent erosion and reduce weed problems. Pre-emergent herbicides may be necessary where weeding is not practical.
5. On slopes where erosion may be a problem, jute net or excelsior blankets may be installed prior to planting, and plants tucked into the soil through slits in the net. Such plants should be put in a staggered pattern to minimize erosion.

d) Establishment

1. Some watering, weeding, remulching, and fertilizing may be required of a new planting during the period of establishment. Soil movement is not recommended. This could cause soil erosion and/or root injury. Competing weeds should be controlled.
2. If a controlled-release fertilizer was used at the time of planting, additional fertilizing will not be necessary for several years. Otherwise, fertilize plantings in the spring of the second growing season and thereafter as needed, using 2 to 3 pounds per 100 square feet of a granulated commercial fertilizer such as 6-12-12.
3. Trim old growth as needed to improve the appearance of ground covers. Most covers need once-a-year trimming to promote growth. Maintain mulch cover with additions of mulch where needed.

Riprap

Description

Riprap is a permanent, erosion-resistant ground cover of large, loose, angular stone (see Figures 3 and 4).

The purpose of riprap is:

1. To protect the soil surface from the erosive forces of concentrated runoff.
2. To slow the velocity of concentrated runoff while enhancing the potential for infiltration.
3. To stabilize slopes with seepage problems and/or non-cohesive soils.

Riprap may be used, as appropriate, at stormdrain outlets, on channel banks and/or bottoms, roadside ditches, drop structures, at the toe of slopes, etc.

Planning Considerations

Riprap is classified as either graded or uniform. A sample of graded riprap would contain a mixture of stones that vary in size from small to large. A sample of uniform riprap would contain stones that are all fairly close in size. For most applications, graded riprap is preferred to uniform riprap. Graded riprap forms a flexible self-healing cover, while uniform riprap is more rigid and cannot withstand movement of the stones. Graded riprap is cheaper to install, requiring only that the stones be dumped so that they remain in a well-graded mass. Hand or mechanical placement of individual stones is limited to that necessary to achieve the proper thickness and line.

Uniform riprap requires placement in a more or less uniform pattern, requiring more hand or mechanical labor. Riprap sizes can be designated by either the diameter or the weight of the stones. It is often misleading to think of riprap in terms of diameter, since the stones should be rectangular instead of spherical. However, it is simpler to specify the diameter of an equivalent size of spherical stone. Table 2 list some typical stones by weight, spherical diameter and the corresponding rectangular dimensions. These stone sizes are based upon an assumed specific weight of 165 pounds/ft³.

Since graded riprap consists of a variety of stone sizes, a method is needed to specify the size range of the mixture of stone. This is done by specifying a diameter of stone in the mixture for which some percentage, by weight, will be smaller. For example, d_{85} refers to a mixture of stones in which 85 percent of the stone by weight would be smaller than the diameter specified. Most designs are based on d_{50} . In other words, the design is based on the median size of stone in the mixture.

Table 3. Size of riprap stones

Weight (pounds)	Diameter (feet)	Length (feet)	Width, Height (feet)
50	0.8	1.4	0.5
100	1.1	1.75	0.6
150	1.3	2.0	0.67

300	1.6	2.6	0.9
500	1.9	3.0	1.0
1000	2.2	3.7	1.25

Since riprap is used where erosion potential is high, construction must be sequenced so that the riprap is put in place with the minimum possible delay. Disturbance of areas where riprap is to be placed should be undertaken only when final preparation and placement of the riprap can follow immediately behind the initial disturbance. Where riprap is used for outlet protection, the riprap should be placed before or in conjunction with the construction of the pipe or channel so that it is in place when the pipe or channel begins to operate.

Specifications

1. The riprap shall be composed of a well-graded mixture down to the one-inch size particle such that 50 percent of the mixture by weight shall be larger than the d_{50} size as determined from the design procedure. A well-graded mixture as used herein is defined as a mixture composed primarily of the larger stone size with a sufficient mixture of other sizes to fill the progressively smaller voids between the stones. The diameter of the largest stone size in such a mixture shall be 1.5 times the d_{50} size.
2. The site manager, after determining the riprap size that will be stable under the flow conditions shall consider that size to be a minimum size and then, based on riprap gradations actually available in the area, selects the size or sizes that equal or exceed the minimum size.
3. The minimum thickness of the riprap layer shall be 1.5 times the maximum stone diameter but not less than 6 inches.
4. Stone for riprap shall consist of clean or washed field stone or rough unhewn quarry stone of approximately rectangular shape. The stone shall be hard and angular and of such quality that it will not disintegrate on exposure to water or weathering. The specific gravity of the individual stones shall be at least 2.5.
5. Riprap for channel stabilization shall be designed to be stable for the condition of bank-full flow in the reach of channel being stabilized. Riprap shall extend up the banks of the channel to a height equal to the maximum depth of flow or to a point where vegetation can be established to adequately protect the channel.

Maintenance

Once a riprap installation has been completed, it should require very little maintenance. It should, however, be inspected periodically to determine if high flows have caused scour beneath the riprap or dislodged any of the stone. If repairs are needed, they should be accomplished immediately.

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CHAPTER 4—RECLAMATION

Upon completion of borrow activities, the site should be brought to the desired final grade and stockpiled topsoil should be applied. Final contours should resemble original contours as closely as possible with slopes not to exceed 2:1. Measures should be taken to provide permanent ground cover through seeding or sprigging. Temporary erosion controls should be removed after establishment of permanent ground cover.

Topsoil Application

After the application of the topsoil to such a depth as needed, the area shall be harrowed and disked entirely through the layer of topsoil and into the subsoil to a depth of at least 2 inches in order to secure proper bond of the topsoil with the subsoil. At this stage all large lumps, large rocks, roots, or other objectionable matter shall be gathered up and disposed. On such areas where the application of topsoil involves primarily the backfilling of rills or small washes, ground preparation may be delayed until just before the application of fertilizer and grassing operations.

Permanent Seeding

Description

Permanent seeding is the establishment of permanent vegetation on disturbed areas by planting seed. The purpose of permanent seeding is to reduce erosion and decrease sediment yield from disturbed areas and stabilize disturbed areas in a manner that is economical, adaptable to site conditions, and allows selection of the most appropriate plant materials.

Permanent seeding should be applied to disturbed areas where permanent, long-lived vegetative cover is needed to stabilize the soil and rough graded areas that will not be brought to final grade for several months or more.

Planning Considerations

1. Protect the area from excess runoff as necessary with diversions, waterways, or sediment basins.
2. Evaluate the capabilities and limitations of the soil to be seeded. Special attention needs to be given to soil pH, texture, internal water movement, steepness, and stability in order to plan the appropriate treatment.
3. Plant species should be selected on the basis of timing of establishment, planned use of the area, and the amount or degree of maintenance that can be devoted to the area in the future.

4. Fertilizer, lime, seedbed preparation, seed coverage, mulch, and irrigation should be used as necessary to promote quick plant growth.

Specifications

a) Site Preparation

1. Soil materials should be capable of supporting permanent vegetation and have at least 25 percent silt and clay to provide an adequate amount of moisture holding capacity. An excessive amount of porous sand will not consistently provide sufficient moisture for good growth regardless of other soil factors.
2. Where compacted soils occur, they should be broken up sufficiently to create a favorable rooting depth of 6-8 inches.
3. Stockpile topsoil to apply to sites that are otherwise unsuited for establishing vegetation.
4. Grade as needed and feasible to permit the use of conventional equipment for seedbed preparation, seeding, mulch application and anchoring, and maintenance. After the grading operation, spread topsoil where needed.
5. Install the needed erosion control practices such as diversions, waterways, and sediment basins.

b) Seedbed Preparation

The seedbed is prepared using the same guidelines detailed in Chapter 3, C (Soil Stabilization Measures).

c) Seed Application

After seedbed preparation, seed may be applied by drilling, broadcasting or hand application. All broadcast seed shall have straw mulch placed over the area to promote water retention, soil stabilization and seed germination. All seeding on slopes will be covered with straw mulch and crimped in use dozer track or disk harrow running cross slope. This will provide adequate stabilization to the slopes until seed germination can occur.

Maintenance

Maintenance is a vital factor in maintaining an adequate vegetative erosion control cover.

- Irrigation - If soil moisture is deficient, supply new seedlings with adequate water for plant growth until they are firmly established. This is especially true when seedlings are made late in the planting season, in abnormally dry and hot season, or on adverse sites.

- **Repairs** - Inspect all seeded areas for failures and make necessary repairs, replacements, reseeding, and remulching within the planting season.
 1. If stand is inadequate, (less than 85 percent groundcover) overseed, fertilize, using half of rates originally applied, and mulch.
 2. If stand is more than 60 percent damaged, reestablish following original seedbed preparation methods, seeding and mulching recommendations and apply lime and fertilizer as needed according to a soil test.

Table 4. Guidelines for selecting permanent seeding

Permanent Plant Mixtures	Application Rate Per Acre	Plant Dates
Tall Fescue	45 Pounds	Feb. 15 - Apr. 15
White Clover	3 Pounds	Sep. 15 - Oct. 15
Crownvetch	20 Pounds	Feb. 15 - Apr. 15
Tall Fescue	30 Pounds	Aug. 15 - Oct. 15
Jupunica Lespedeza	45 Pounds	Mar. 1 - May 15
Korean or Kobe Lespedeza	8 Pounds	
Weeping Love grass	3 Pounds	Apr. 15 - Jul. 15
Common Bermuda grass	14 Pounds	

Hydroseeding

Description

Hydroseeding is the application of seed, fertilizer, necessary organic soil amendments, fibrous mulch, and a tachifier. The products are applied as a single, uniformly applied, sprayed slurry under pressure over the entire area.

Specifications

a) Seed Classification.

State approved seed of the latest season's crop shall be provided in original sealed packages bearing the producer's guaranteed analysis for percentages of mixture, purity, germination, hard seed, weed seed content, and inert material. Labels shall be in conformance with AMS-01 and applicable state seed laws.

b) Seed Mixtures.

Seed will be applied at a rate of 45 lbs per acre and shall be proportioned by weight as follows:

<u>Name</u>	<u>Mixture Percent by Weight</u>
Korean Lespedeza	10%
White Clover	8%
KY31 Fescue, Fungus Free	82%

c) Fertilizer.

Fertilizer shall be commercial grade, free flowing, uniform in composition and conforming to CID A-A-1909. Granular Fertilizer shall be applied at a rate of 500 lbs per acre with a guaranteed analysis of 6-12-12.

d) Wood Cellulose Fiber Mulch.

Wood cellulose fiber shall not contain any growth or germination-inhibiting factors and shall be dyed an appropriate color to facilitate visual metering during application. Composition on air-dry weight basis: 9 to 15 percent moisture, pH range from 4.5 to 6.0.

e) Tachifier.

A biodegradable tachifier shall be applied at a rate of 100 lbs per acre.

f) Seeding Time.

The hydroseeding operation should be conducted from 15 February to 1 May to obtain the best results.

G) Tillage.

Soil on slopes gentler than 3-horizontal-to-1-vertical shall be tilled to a minimum depth of four inches. On slopes between 3-horizontal-to-1-vertical and 1-horizontal-to-1 vertical, the soil shall be tilled to a minimum depth of 2 inches by scarifying with heavy rakes, or other method. Rototillers shall be used where soil conditions and length of slope permit. On slopes 1-horizontal-to-1 vertical and steeper, no tillage is required.

h) Final Grade Preparation.

Turf areas shall be filled as needed or have surplus soil removed to attain the finished grade. Drainage patterns shall be maintained as indicated on drawings. Turf areas compacted by construction operations shall be completely pulverized by tillage. Soil used for repair of erosion or grade deficiencies shall conform to topsoil requirements specified by the grading requirements. Finished grade shall be 1 inch below the adjoining grade of any surfaced area. New surfaces shall be blended to existing areas.

i) Satisfactory Stand of Turf.

A satisfactory stand of turf from the seeding operation is defined as a minimum of 10 grass plants per square foot. The total bare spots shall not exceed 2 percent of the total seeded area.

Maintenance During Establishment Period

Maintenance of the turfed areas shall include eradicating weeds, eradicating insects and diseases, protecting embankments and ditches from erosion, maintaining erosion control materials and mulch, protecting turfed areas from traffic, mowing, watering, and post-fertilization.

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REFERENCES

Kentucky Division of Conservation and Division of Water. August 1994. Kentucky Best Management Practices for Construction Activities. Kentucky Division of Conservation and Division of Water.

Tennessee Department of Environment and Conservation. July 1992. Tennessee Erosion & Sediment Control Handbook: A Guide for Protection of State Waters through Effective Management Practices during Construction Activities. Tennessee Department of Environment and Conservation.

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AFZB-DPW-E-R

Contract# _____

Contractor: _____

Vehicle Tag # _____

Material: Excavation
Disposition

Material Type: Topsoil
Fill

Dates of Excavation: _____

Quantity to be moved: _____

Authorized by Joseph D. Whitfill

Date: _____

Signature _____



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